SELECTED WATER RESOURCES ABSTRACTS

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WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

CONTENTS

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

MAN'S INFLUENCE ON THE HYDROLOGICAL CYCLE: A DRAFT REPORT OF THE UNESCO/FAO WORKING GROUP ON THE INTERNATIONAL HYDROLOGICAL DECADE.
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
Food and Agriculture Organization of the United Nations, Rome, Water Resources and Development Service, Land and Water Development Division, Irrigation and Drainage Paper, Special Issue No 17, 1973. 71 p.

Descriptors: *Hydrologic cycle, *Environmental effects, *Water resources development, *Hydrologic data, *Water management(Applied), Arid lands, Europe, Asia, North America, South America, Australia, Africa, Engineering, Irrigation, Groundwater, Reservoir evaporation, Social aspects, Hydrologic properties, Land use.

Three essays explored consequences of human interference with the hydrological cycle. Man's efforts to control the world's water cycle involves factors other than hydrology and engineering; ecological, sociological, economic, cultural, and political considerations and forces must also be taken into account. The first paper explains the hydrological cycle of the waters of the earth. A following section details human impact on the hydrological cycle and finds this impact increasingly negative; pollution of water and air, salinization of irrigation districts, mining of groundwater in arid lands, and potential threats to the stability of the hydrologic regime which to date has sustained human life. The book concludes with an examination of man's greatest obstacle in realizing his hydrologic dreams: man. Examples of international and national failures in planning and executing water projects and the prospects presented by growing pollution and population are discussed. (See W75-10864 thru W75-10866) (Bowden-Arizona)
W75-10863

THE NATURE AND COMPONENTS OF THE HYDROLOGICAL CYCLE,
University Coll., Dublin, (Ireland). Dept. of Civil Engineering.
J. C. I. Dooge.
In: Man's Influence on the Hydrological Cycle, Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper Special Issue No 17, p 1-18, 1973. 1 fig, 4 tab, 31 ref.

Descriptors: *Hydrologic cycle, *Hydrologic data, *Environmental effects, *Hydrologic properties, *Solar radiation, Atmosphere, Evaporation, Transpiration, Groundwater, Precipitation(Atmospheric), Movement, Soil water, Chemical reactions, Physical properties, Biological properties, Water pollution effects, Water storage, Infiltration, Surface waters.

Hydrologic interests focus on transfer of water from one form to another. In the hydrological cycle, the total amount of global water remains constant. Movement of water in the cycle is influenced by the supply of energy in the form of incoming solar radiation. Individual hydrological processes of precipitation, evaporation and transpiration, infiltration and surface storage, soil water, groundwater, channel and lake storage and snow and ice conditions are discussed, describing how these processes are capable of changing from one hydrologic aspect to another. The secondary (physical, chemical, biologic and pollution) effects of water on human environment are illustrated, emphasizing the consequences which can result from modification of the hydrological cycle by human activity. (See also W75-10863) (Michael-Arizona)
W75-10864

BALANCING THE EFFECTS OF MAN'S ACTIONS ON THE HYDROLOGICAL CYCLE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
A. B. Costin, and J. C. I. Dooge.
In: Man's Influence on the Hydrological Cycle, Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper Special Issue No 17, p 19-51, 1973. 2 fig, 64 ref.

Descriptors: *Hydrologic cycle, *Hydrologic aspects, *Land use, *Urbanization, *Water management(Applied), Topography, Water storage, Surface runoff, Soil erosion, Surface waters, Soil water, Evapotranspiration, Percolation, Weather modification, Evaporation control, Transpiration control, Irrigation, Saline water, Drainage practices, Desalination, Forestry, Water pollution.
Identifiers: Moisture interception, Thames River, Mekong River.

Water, the most manageable of the natural resources, is capable of diversion, transport, storage and recycling. However, great care must be taken in developing one aspect of the hydrological cycle so that other hydrologic components are not adversely affected. Hydrological changes resulting from land use practices are discussed, showing how readily terrain alterations affect precipitation, surface, and sub-surface waters. Man's attempts to control hydrological processes by weather modification, evaporation and transpiration controls, control of soil water movement, engineering techniques to increase availability, and irrigation and drainage often have considerable side effects. Natural hydrologic processes can be greatly upset by practices which seem superficially beneficial, including desalination, forestry practices and urbanization. Examples of pollution effects are presented for the Thames and Mekong Rivers. The need for logical decisions in water management is vital and any alteration of one hydrological component must take into consideration all others. (See also W75-10863) (Michael-Arizona)
W75-10865

HUMAN OBSTACLES TO THE CONTROL OF THE HYDROLOGICAL CYCLE FOR THE BENEFIT OF MAN,
Technion - Israel Inst. of Tech. Haifa (Israel). Dept. of Agricultural Engineering.
H. Finkel.
In: Man's Influence on the Hydrological Cycle, Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper Special Issue No 17, p 53-69, 1973.

Descriptors: *Hydrologic cycle, *Administrative decisions, *Water law, *Legislation, *Water resources development, Legal aspects, Water allocation(Policy), Water rights, Water policy, Water management(Applied), Government.

Many of the world's hydrological problems are due to inefficient and ineffectual management of development projects. Political, historic and nationalistic factors often weigh heavily on development decisions. Many world wide hydrological problems result from inadequate international legislation and enforcement. On a national level, conflicts often arise between urban, industrial and agricultural interests. Economic and financial troubles internationally and locally often limit water development projects. The central problem of hydrological development is population increase. Due to the annual population growth rates in developing countries, hydrological development programs are often obsolete before completed. Effective planning of hydrological resource development must overcome grave human obstacles including data gaps and education, training, and ability deficits in developing countries. (See also W75-10863) (Michael-Arizona)
W75-10866

PREDICTING RECESSIONS THROUGH CONVOLUTION,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
For primary bibliographic entry see Field 2E.
W75-10917

SUBSURFACE FLOW FROM SNOWMELT TRACED BY TRITIUM,
Swiss Federal Inst. for Snow and Avalanche Research, Davos-Weissfluhjoch.
For primary bibliographic entry see Field 2F.
W75-10921

THE HYDROLOGIC CYCLE--AS APPLICABLE TO THE PACIFIC NORTHWEST,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W75-10949

MOISTURE AND ENERGY CONDITIONS IN A DRAINING SOIL MASS,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 2G.
W75-11054

PROCESS STUDIES AND MODELING OF SELF-CLEANING CAPACITY OF MOUNTAIN CREEKS FOR RECREATION PLANNING AND MANAGEMENT,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W75-11055

MULTILAG MARKOV MODELS FOR EASTERN AUSTRALIAN STREAMS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11301

DETECTION OF CHANGE IN SEQUENCES OF HYDROLOGIC DATA,
Melbourne and Metropolitan Board of Works (Australia).
For primary bibliographic entry see Field 7C.
W75-11302

GENERATION OF ARID ZONE RAINFALL AND RUNOFF,
University of New England, Armidale (Australia). School of Natural Resources.
I. H. Fisher.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 90 - 94, May 1975. 2 fig, 1 tab, 17 ref.

Descriptors: *Rainfall-runoff relationships, *Synthetic hydrology, *Pasture management, *Arid lands, *Australia, Computer models, Grazing, Water balance.

In an investigation of optimal management policies for livestock grazing a large paddock in arid southern Australia, a model using synthetic daily rainfall input was required to simulate runoff from, and the wide variation of soil moisture in, the paddock. Some problems associated with the

development of such a model are outlined. A statistical analysis of historical rainfall is presented which supports the separation of the generation of the occurrence of wet and dry days from the determination of the magnitude of the nonzero daily rainfalls when constructing synthetic traces. Modifications made to an existing model to include only those processes important in arid conditions are discussed. Also described is a method devised to allow for horizontal transfer of runoff within a paddock between subdivisions relating to factors of importance to both water balance and grazing management policies. (CSIRO)
W75-11303

2B. Precipitation

WATER RESOURCE OBSERVATORY CLIMATOLOGICAL DATA, WATER YEAR 1973.
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 7C.
W75-11035

ANALYSIS OF COLORADO PRECIPITATION,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
M. Kuo, and S. K. Cox.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 717, $3.75 in paper copy, $2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No 63, June 1975. 36 p, 10 fig, 9 tab, 7 ref. OWRT A-018-COLO(2).

Descriptors: *Precipitation(Atmospheric), *Storms, *Colorado, Data collections, Spatial distribution, Temporal distributions, Seasonal, Thunderstorms, Distribution patterns.

The precipitation trend in Colorado was studied statistically using 56 years of data collected at 61 stations. The precipitation had an annual decrease of 0.01 inches over the 56 year period although this result was not statistically significant. Precipitation periods (referred to as storms) were used to describe the variation of the precipitation in space and time. The state of Colorado was divided into six geographic regions, and area weighted hourly precipitation data were summed to obtain the volume of water yielded by each storm. It was found that 80% of the annual volume is produced by 30% of the storms. The western third of the state shows no marked seasonal variation in precipitation, but its southern half receives more precipitation than its northern half. The middle third of the state receives 60% of its precipitation in the summer, and the eastern part, the high plains, receives 80% during the summer months. Thunderstorms predominate during the summer, large scale storms in the winter. The summer precipitation volume is correlated with the annual volume in all regions. After categorizing the storms by their precipitation volume, it was found that wetter years contain more storm events of all sizes than the driest years with no noticeable change in the distribution of the size of the storms. (Martin-Colorado State)
W75-11040

AN ELEVATIONAL CONTROL OF PEAK SNOWPACK VARIABILITY,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Colorado Univ., Boulder. Dept. of Geography.
For primary bibliographic entry see Field 2C.
W75-11155

CONDENSATION IN JETS, INDUSTRIAL PLUMES AND COOLING TOWER PLUMES,
Waterloo Univ. (Ontario). Dept. of Mechanical Engineering.
T. M. L. Wigley.
Journal of Applied Meteorology, Vol 14, No 1, p 78-86, February 1975. 7 fig, 3 tab, 15 ref, append.

Descriptors: *Condensation, *Jets, *Cooling towers, *Saturation, Buoyancy, Drops(Fluids), Supersaturation, Humidity, Precipitation(Atmospheric), Temperature, Pressure, Environment, Fallout, Equations, Mathematical studies.
Identifiers: Cooling tower plumes, Industrial plumes.

The one-dimensional theory for the condensation of buoyant plumes was extended to include supersaturation as an extra variable. An additional equation describing the dynamics of droplet growth was used to make the system tractable. Some simple mathematical results were obtained which allowed the theory to be related to, and so extended, a commonly used graphical representation of the condensation process. The theory was then simplified to a single nonlinear first-order differential equation for the condensed water content. This was solved numerically for a typical jet, scrubbed industrial plume, and natural-draft cooling tower plume to obtain down-plume profiles of condensed water content, supersaturation, and mean droplet size. High supersaturation was predicted in all three cases, corresponding to mean relative humidities of up to 170% (jet), 150% (scrubbed plume), and 105% (cooling tower). These results may be important in predicting the growth of 'foreign' carry-over droplets in plumes from industrial sources or cooling towers. Predictions of plume length in these cases was found to be insensitive to supersaturation, but plume length was noticeably affected by supersaturation in the case of a jet. In the examples considered maximum mean droplet radii never exceeded 10 micrometers which supports the belief that rainout is caused primarily by carry-over from imperfect mist eliminators. (Jones-ISWS)
W75-11166

CHARGED DROPLET COLLISION EFFICIENCY MEASUREMENTS,
National Center for Atmospheric Research, Boulder, Colo.
C. E. Abbott.
Journal of Applied Meteorology, Vol 14, No 1, p 87-90, February 1975. 4 fig, 1 tab, 10 ref.

Descriptors: *Drops(Fluids), *Laboratory tests, *Cloud physics, Efficiencies, Measurement, Photography, Instrumentation, Evaluation, Analytical techniques.
Identifiers: *Collision efficiencies, Charged droplets, Electrostatics.

Experimental measurements were presented for collision efficiencies of highly charged droplets. The drop sizes studied ranged in radius from 10 to 25 micrometers and carry charges of the order of 10 to the -4th power esu. Measured collision efficiencies greater than 100 agreed well with those predicted by Paluch's analytical solution for collision efficiency upper limit. For smaller values, the collision efficiencies predicted from Davis and from Davis and Sartor exceeded those measured. (Jones-ISWS)
W75-11168

WIND-SNOW RELATIONS AT MARMOT CREEK, ALBERTA,
Atmospheric Environment Service, Calgary (Alberta).
For primary bibliographic entry see Field 2C.
W75-11226

DETECTION OF CHANGE IN SEQUENCES OF HYDROLOGIC DATA,
Melbourne and Metropolitan Board of Works (Australia).
For primary bibliographic entry see Field 7C.
W75-11302

SOME OBSERVATIONS ON RAINFALL IN WESTERN NEW SOUTH WALES,
New South Wales Univ., Kensington (Australia). School of Wool and Pastoral Sciences.
S. J. Filan.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 95-98, May 1975. 11 ref.

Descriptors: *Rainfall, *Probability, *Forecasting, *Arid lands, *Australia, Statistical methods, Decisions making, Sheep, Marketing, Sampling, Estimating.
Identifiers: New South Wales.

Probability distributions for monthly rainfall at several western New South Wales sites were required for constructing a simulation model of sheep and wool production and a model for time-of-marketing decisions for sheep. Standard forms of distribution function were found to fit the data fairly well, but there were some systematic departures. It was not possible to test the possibility that this was due to mixed distributions; however, it was established that the data exhibit autocarrelation to a statistically significant degree, indicating that normal sampling and estimation procedures are of uncertain reliability. The autocorrelation could be expressed in terms suitable for application in decision-making within the pastoral industry. (CSIRO)
W75-11304

ASPECTS OF RAINFALL MEASUREMENT IN A NEW ENGLAND LOCATION,
University of New England, Armidale (Australia). Dept. of Geography.
I. J. Jackson.
Australian Meteorological Magazine, Vol 22, No 2, p 37 - 47, June 1974. 3 fig, 8 tab, 13 ref.

Descriptors: *Rain gages, *Gaging stations, *Rainfall, Measurement, *Australia.

An experiment to assess the impact of mounting and site on rain-gauge catch is described. Factors considered include site exposure and slope, and mounting horizontally or parallel to the slope. When compared to the magnitude of random variations between gauges mounted on a site at a height of 30.5 cm, the influence of mounting and siting was not as great as might have been anticipated. (CSIRO)
W75-11309

2C. Snow, Ice, and Frost

DIFFERENTIAL RELEASE OF WATER FROM ARIZONA SNOWPACKS,
Arizona Univ., Tucson. Dept. of Watershed Management.
M. E. Jones.
Arizona University, Tucson, Department of Watershed Management, MS Thesis, 1974. 53 p, 4 fig, 1 tab, 2 append, 25 ref.

Descriptors: *Snowmelt, *Lysimeters, *Arizona, *Melt water, *Snow management, Snowpacks, Runoff, Snow, Melting, Water sources, Water supply, Discharge(Water), Arid climates, Semiarid climates, Ponderosa pine trees.

Installation of Haupt volumetric snow lysimeters in open and forested areas of Arizona showed that the winter season snowmelt outflow for all sites was 9.8 inches and runoff efficiency was 68 percent. The estimated average daily snowmelt outflow was 0.2 inches per day and 0.4 inches per day maximum. The snow lysimeters were used in a study to identify optimum sites for melt water yield in terms of forest overstories. Identification of such sites would provide a guide toward minimizing the ratio of vapor to liquid water loss from the snowpacks. (McLachlan-Arizona)
W75-10860

AN ASSESSMENT OF SNOWPACK DEPLETION-SURFACE RUNOFF RELATIONSHIPS ON FORESTED WATERSHEDS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 4A.
W75-11049

WEYL'S THEORY OF GLACIATION SUPPORTED BY ISOTOPIC STUDY OF NORWEGIAN CORE K 11,
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioactivities.
For primary bibliographic entry see Field 2J.
W75-11153

AN ELEVATIONAL CONTROL OF PEAK SNOWPACK VARIABILITY,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Colorado Univ., Boulder. Dept. of Geography.
N. Caine.
Water Resources Bulletin, Vol 11, No 3, p 613-621, June 1975. 4 fig, 3 tab, 11 ref. Bureau of Reclamation Contract 14-06-D-7052.

Descriptors: *Snowpacks, *Mountains, *Snow surveys, *Variability, *Colorado, Snow cover, Snow, Elevation, Snowfall, Snowmelt, Weather modification, Model studies, Regression analysis, Correlation analysis, On-site investigations, Measurement, Meteorology, Precipitation(Atmospheric).
Identifiers: *San Juan Mountains(Col), Snow accumulation.

The records of the seasonal peaks in snow accumulation on 24 snow courses showed that the relative variability (measured by the coefficient of variation) is inversely related to elevation in the San Juan Mountains in southwestern Colorado. Analysis on an annual basis showed that this is due to a tendency for the peak snowpack at high elevations to be closer to the long-term mean, while at low levels, peak snowpack is further from the normal. This was true in both above-normal and below-normal accumulation seasons. Extrapolation of 20 annual elevation-accumulation trends suggests that mean accumulation is reached at 4107 + or -186 m elevation. This is approximately the height of the topographic barrier of the San Juan Mountains, suggesting that the pattern of variability is a partial function of an atmospheric-topographic interaction. (Sims-ISWS)
W75-11155

WIND-SNOW RELATIONS AT MARMOT CREEK, ALBERTA,
Atmospheric Environment Service, Calgary (Alberta).
D. Storr.
Can J For Res. Vol 3, No 4, p 479-485, 1973, Illus.

Descriptors: *Canada, Snow, Wind, *Snow management, *Snowfall, *Wind velocity, Forest management, Clear-cutting.
Identifiers: *Marmot Creek(Alberta), *Snow-wind relationships.

Wind patterns are crucial factors to be considered in the design of artificial clearings in the forest to trap and retain snow. Winds at Marmot Creek (Alberta, Canada) during snowfall are predominantly southeasterly but are quite light; over 80% of the snow falls with winds less than 4.5 m/s. Maximum winds occur between snowfalls, and favor the southwest to northwest quadrant. The average maximum hourly wind per month is less than 7 m/s in the lower reaches but increases with elevation to 16 m/s at treeline.--Copyright 1974, Biological Abstracts, Inc.
W75-11226

HOW BP ALASKA CEMENTS THROUGH PERMAFROST.
For primary bibliographic entry see Field 8F.
W75-11278

HYDROLOGIC RELATIONS ON UNDISTURBED AND CONVERTED BIG SAGEBRUSH LANDS: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W75-11313

2D. Evaporation and Transpiration

EVAPOTRANSPIRATION OF FOUR FOREST TYPES MEASURED WITH THE EDDY CORRELATION TECHNIQUE,
Washington Univ., Seattle. Coll. of Forest Resources.
L. J. Fritschen, H. R. Holbo, and M. O. Smith.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 695, $3.75 in paper copy, $2.25 in microfiche. Completion Report, June 24, 1975. 24 p, 7 fig, 2 tab, 9 ref. OWRT A-061-WASH(1). 14-31-0001-4048.

Descriptors: Eddies, Instrumentation, Measurement, Canopy, *Evapotranspiration, *Forests, Meteorology, Design, Analytical techniques.
Identifiers: *Eddy correlation technique, Forest canopies, Sensible heat flux, Spectral analysis, Fluxation.

Eddy correlation instrumentation for evapotranspiration estimation from forest canopies has been evaluated. The frequency response of the Gill-type propeller is probably adequate for obtaining vertical windspeeds, but fine glass-bead thermistors are not fast enough to capture the temperature fluctuations. A fluxatron for the direct assessment of the sensible heat flux was designed and built. In comparison with covariance and cospectral computations made from high frequency data, the fluxatron exhibited a good potential for independently forming and outputing flux estimates. Spectral analyses of the turbulence above the canopy show a wide range of frequencies, extending much lower in frequency than those normally reported. As a consequence, the bandwidth of the fluxatron must be increased. Due to the short wavelength of some of the turbulence, it will also be necessary to mount the anemometer and the thermometer as close together as practicable.
W75-11044

THE MEASUREMENT AND ESTIMATION OF LAKE EVAPORATION FROM FOUR AUSTRALIAN WATER STORAGES,
Bureau of Meteorology, Melbourne (Australia).
E. D. Hoy, and S. K. Stephens.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 70-74, May 1975. 4 fig, 3 tab, 9 ref.

Descriptors: *Evaporation, *Lakes, *Estimating, Water loss, Reservoirs, Measurement, Heat balance, Evaporation pans, *Australia, Data collections.
Identifiers: Lake Eucumbene(NSW), Cataract Reservoir(NSW), Manton Reservoir(NT), Mundaring Reservoir(WA).

Estimates of lake evaporation by the bulk aerodynamic method and the pan conversion method have been evaluated relative to the heat budget method at four Australian lakes. The results for Lake Eucumbene, Cataract Reservoir and Mundaring Reservoir gave standard errors of estimate of 10% in monthly totals of lake evaporation calculated from both methods. At Manton Reservoir only the bulk aerodynamic method has been shown to estimate monthly lake evaporation totals with a standard error estimate of 10%. Monthly totals of pan evaporation and lake evaporation are presented for all lakes. (CSIRO)
W75-11300

2E. Streamflow and Runoff

MEASUREMENT OF COBBLE ABRASION IN NATURAL STREAMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2J.
W75-10881

FLOOD RUNOFF FROM URBAN AREAS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-10904

AUTOMATED DISTRIBUTION OF GAUGE AND SHIFT CORRECTIONS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10911

FLOW FILE OPERATIONS MANUAL,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10913

AUTOMATED HOURLY COMPUTATIONS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10915

PREDICTING RECESSIONS THROUGH CONVOLUTION,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
P. Yates, and W. M. Snyder.
Water Resources Research, Vol 11, No 3, p 418-422, June 1975. 13 fig, 2 tab, 11 ref.

Descriptors: *Recession curves, *Hydrographs, *Streamflow, *Base flow, *Methodology, Optimization, Hydrologic data, Model studies, Watersheds(Basins), Groundwater.
Identifiers: *Convolution method, *Ahoskie Creek(NC).

Streamflow during recessions, that is, during periods of little or no rain, represents a dependable minimum supply of water. However, quantitative mathematical expressions are still lacking for predicting flow during recession periods. A convolutional model of streamflow recession was formulated and tested utilizing sequential values of mean daily discharge. Parameters of the model were determined by optimization wity historical streamflow records. Preliminary relationships of parameters to rate of flow and size of drainage area were explored. (Singh-ISWS)
W75-10917

IMPLICIT NUMERICAL MODELING OF UNSTEADY FLOWS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-10925

RELATIVE IMPORTANCE OF DECISION VARIABLES IN FLOOD FREQUENCY ANALYSIS,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 4A.
W75-10929

STREAMFLOW IN THE NEW YORK PART OF THE SUSQUEHANNA RIVER BASIN,
Geological Survey, Albany, N.Y.
H. F. H. Ku, A. D. Randall, and R. D. MacNish.
New York State Department of Environmental Conservation, Albany, Bulletin 71, 1975. 130 p, 31 fig, 10 tab, 60 ref, 4 append.

Descriptors: *Streamflow, *Hydrologic data, *New York, *Watershed management, Evaluation, Runoff, Discharge(Water), Flow duration, Flood frequency, Droughts, Water quality, Water utilization, Water demand, Correlation analysis.
Identifiers: *Susquehanna River basin(NY), Streamflow summary.

The Susquehanna River basin occupies about 6,500 square miles in south-central New York. Continuous records of streamflow at 60 gaging stations are summarized by tables of flow duration and low-flow frequency for the 1931-60 standard period and (or) for periods of record through 1959 and 1967. Similar statistics are developed by correlation for 110 partial-record stations. Record low flows for one or more periods were set at 26 of 37 long-term gaging stations during the drought of the 1960's, and the cumulative runoff deficiency equaled 1-1/2 years of normal runoff. Maps of annual precipitation and runoff show that precipitation is several inches greater in the eastern part of the basin than in the western part, but evapotranspiration is slightly greater in the west. Requirements for within-year and carryover storage with 2- to 10-percent risks of deficiency are presented for gaged sites and may be estimated for ungaged sites from low-flow and mean-runoff parameters. Flood magnitude and frequency at gaging stations are summarized, and three regions are defined within which floods on major streams have a consistent relation to basin size. (Woodard-USGS)
W75-10931

TEMPERATURES OF KANSAS STREAMS,
Geological Survey, Lawrence, Kans.
C. V. Burns.
Kansas Water Resources Board, Topeka, Streamflow Characteristics Technical Report No 12, July 1975. 220 p.

Descriptors: *Water temperature, *Streams, *Kansas, *Basic data collections, Gaging stations, Sites, Streamflow, Discharge(Water), Hydrologic data, Correlation analysis.
Identifiers: *Water temperature frequency distribution, Discharge frequency distribution, Average temperatures, Maximum temperatures, Minimum temperatures.

Water temperature observations in Kansas, made in conjunction with discharge measurements, are presented for the period of record beginning with three stations in 1948 and increasing to about 240 stations by 1972. Water temperature data for each station are summarized both monthly and for the period of record giving the mean, standard deviation, range between maximum and minimum, and number of observations. Graphs show the frequency distributions of time of observation, discharge, and temperature. A plot of temperature versus data illustrates the distribution of all observed data available during 1948-72. (Woodard-USGS)
W75-10933

ESTIMATED AVAILABILITY OF SURFACE AND GROUND WATER IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W75-10938

LOW-FLOW CHARACTERISTICS OF SELECTED STREAMS IN NORTHEASTERN WASHINGTON,
Geological Survey, Tacoma, Wash.
D. E. LaFrance.
Open-file report, 1975. 22 p, 6 fig, 1 plate, 4 tab, 7 ref.

Descriptors: *Washington, *Low flow, *Streamflow, Analytical techniques, Regression analysis, Average flow, Low flow frequency, Gaging stations, Data collections, Hydrologic data, Correlation analysis, Hydrographs, Maps, Sites, Precipitation(Atmospheric), Water utilization, Watershed management, Water demand.
Identifiers: 7-day flows.

Low-flow-frequency curves developed from streamflow records at nine continuous-recording gaging stations in northeast Washington were used to determine discharges for low-flow frequencies of 7, 30, 60, 90, and 183 days. Computed for the nine gaging stations and tabulated in the report are low-flow-frequency data for the 7-day low flows and monthly average low flows at the 2-year recurrence interval. Regression techniques used to estimate the 7-day low flows at 103 miscellaneous short-term sites indicate that correlation coefficients for all except three sites equaled or exceeded 0.90. Low flows varied widely from year to year, as indicated by slope indexes ranging from 1.16 to 8.16 among the 103 miscellaneous sites. The 7-day low flow of the Colville River at Kettle Falls during the periods 1924-32 and 1934-71 ranged from a minimum of 5.29 cfs in 1931 to a maximum of 128 cfs in 1949. (Woodard-USGS)
W75-10939

ESTIMATED MEAN-MONTHLY AND ANNUAL RUNOFF AT SELECTED SITES IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
L. J. Reiland.
Open-file report 74-150, June 1975. 21 p, 1 fig, 3 tab, 6 ref.

Descriptors: *Streamflow, *Natural flow, *Average flow, *Regression analysis, *New Mexico, Natural streams, Estimating, Runoff, Correlation analysis, Gaging stations, Hydrologic data, Methodology.
Identifiers: *Santa Fe County(N Mex), Ungaged streams.

Estimates are shown for natural mean-monthly and annual runoff at 6 selected sites in the Pojoaque River drainage basin, Santa Fe County, N. Mex. Natural runoff is defined as the runoff that would occur if there were no manmade changes. The sites are: Rio Nambe at Nambe Falls, near Nambe; Rio Nambe near Nambe, plus Nambe canal; Rio En Medio at Nambe Pueblo boundary; Rio Chupadero at Nambe Pueblo boundary; Rio Tesuque at Tesuque Pueblo boundary; and Pojoaque River at mouth. Techniques of regression analysis and runoff-elevation relationships were used to estimate runoff where no streamflow records or only short-term records are available. Comparison of estimated mean-annual runoff, using these techniques, with mean-annual runoff obtained from streamflow records at gaged stations within and near the area indicated that the estimated mean-annual runoff at sites unaffected by excessive channel loss was generally within 10 percent, or less, of the gaged runoff. The natural runoff calculated for each of the six sites is believed to be equivalent to runoff for the water years 1920-1968. (Woodard-USGS)
W75-10943

SOME RESULTS ON MASS TRANSFER PROCESSES IN A DENSITY-STRATIFIED FLOW,
Mississippi Univ., University. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W75-11057

EFFECT OF PRESSURE GRADIENT ON WIND-WAVES IN A LABORATORY CHANNEL,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-11093

TRANSITION IN OSCILLATORY FLOW OVER RIPPLED BEDS,
Cambridge Univ., (England). Dept. of Engineering.
For primary bibliographic entry see Field 8B.
W75-11149

DERIVATION OF SURFACE WATER LAG TIME FOR CONVERGING OVERLAND FLOW,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh.
Water Resources Bulletin, Vol 11, No 3, p 505-513, June 1975. 2 fig, 5 ref.

Descriptors: *Time lag, *Overland flow, *Mathematical studies, Basins, *Rainfall intensity, Mannings equation, Chezy equation, Momentum equation, Theoretical analysis, Surface waters, Watersheds(Basins), Hydrodynamics, *Watersheds(Basins).
Identifiers: *Kinematic wave theory, Converging overland flow.

Lag time was defined as the lapse between the time of occurrence of 50% input and 50% output. Generalized and special forms of explicit analytical solutions of surface water lag time were derived for converging overland flow, utilizing the kinematic wave theory which comprises equations of continuity and motion. These solutions related lag time to physically measurable quantities of a watershed, including surface roughness and geometrical parameters. Expressions for lag time were derived both from Manning's and Chezy's equations. Hydrologically similar basins exhibit similar lag time behavior. A similarity factor was defined for comparing basins. (Singh-ISWS)
W75-11156

LABORATORY INVESTIGATION OF ONE-DIMENSIONAL WAVE MOTION IN OPEN CHANNELS,
Tennessee Univ., Knoxville. Coll. of Engineering.
For primary bibliographic entry see Field 8B.
W75-11172

MULTILAG MARKOV MODELS FOR EASTERN AUSTRALIAN STREAMS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
G. L. Wright.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 75-79, May 1975, 1 fig, 3 tab, 15 ref.

Descriptors: *Markov processes, *Streamflow, *Statistical models, Rivers, *Australia, Synthetic hydrology, Analytical techniques.
Identifiers: Victoria, New South Wales, Queensland.

An examination has been made of the validity of lag-one Markov schemes which are commonly used in synthetic streamflow generating models. It has been shown, by consideration of the partial autocorrelation functions calculated for twelve Aus-

tralian rivers, that persistence effects for greater than lagsone are not usually insignificant. On the other hand, after comparing synthetic streamflow sequences produced by Markov schemes up to lag-twelve, no appreciable improvement was found for schemes greater than lag-one. (CSIRO)
W75-11301

DROUGHTS, DISTRIBUTIONS AND DEPENDENCE: AN ANALYSIS OF SOME SYNTHETIC DATA GENERATION METHODS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
D. G. Doran.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 85 - 89, May 1975. 3 fig, 4 tab, 13 ref.

Descriptors: *Low flow frequency, *Synthetic hydrology, *Streamflow forecasting, *Australia, Droughts, Streamflow, Time series analysis, Computer models, Monthly.

The incidence of zero flows and the closely related drought-frequency problem are of major concern with Australia's highly emphemeral streams. Generation techniques of modeling monthly streamflow data do not always adequately preserve the properties of the historical data under such conditions. An examination is made of various model-parameter estimation procedures in their application to some Australian streamflow data, and a method of modelling data with a high incidence of zeros is discussed. An application of an efficient extreme-value parameter estimation procedure is proposed as a test of the drought-preserving ability of various streamflow generation models. (CSIRO)
W75-11305

DIFFICULTIES IN GAUGING SMALL CATCHMENTS - A CASE STUDY,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
D. H. Pilgrim, and B. A. Cornish.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 99 - 103, May 1975. 6 fig, 10 ref.

Descriptors: *Gaging stations, *Small watersheds, *Flow measurement, *Stream gages, Rainfall-runoff relationships, Stage-discharge relations, Time lag, Water levels.

Reasons are outlined for the fundamental difficulty in obtaining high quality streamflow data from small catchments. Serious errors may result, but the problems are often not easily recognized. Extensive field and hydraulic model studies on a 0.38 sq km catchment are used to illustrate the difficulty in obtaining high gaugings, problems in synchronization of streamflow and rainfall records, the appreciable magnitude of velocity distribution and head effects relative to the low range of stages for these catchments, and stage lag in the recorder well. (CSIRO)
W75-11306

AUSTRALIAN ARID ZONE STREANGAUGING,
New South Wales Dept. of Public Works, Sydney (Australia). Water Supply and Sewerage Branch.
R. French, and K. P. Roberts.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 104-106, May 1975. 5 ref.

Descriptors: *Arid lands, *Australia, *Network design, *Streamflow, Flow measurement, Stream gages, Gaging stations, Data processing.

From experience gained in the Northern Territory (Australia), questions are raised concerning the planning, establishment and operation of a stream gauging network which is most likely to produce information useful to the engineer. It is argued that the common view of hydrologic networks as simple sums of men, machinery and physical phenomena is to be abandoned in favor of a systems approach to obtaining data from the hydrometeorologic system. Attention is drawn to the peculiarities of the Australian arid zone and especially to the need to use non-specialists in many tasks and the need to perform hydrologic calculations as the ultimate check of the value of hydrographic data. (CSIRO)
W75-11307

VARIABILITY, PERSISTENCE AND YIELD OF AUSTRALIAN STREAMS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
T. A. McMahon.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers, Australia, Preprints of Papers, p 107-111, May 1975. 12 fig, 3 tab, 10 ref.

Descriptors: *Australia, *Streamflow, *Variability, Low flow, Persistence, Water yield, Streams, Discharge(Water), Asia, Europe, North America, Correlation analysis, Duration curves, Water storage, Reservoirs.
Identifiers: Storage-yield relationships.

Low flow hydrologic characteristics of 156 Australian streams were reviewed and results compared with Asian, European and North American streams. Coefficients of variation and skewness, serial correlation, low flows as defined by flow duration curves and storage-yield values were studied. Australian streams were considerably more variable than northern hemisphere ones. The coefficient of variation was more highly correlated with other characteristics than the mean flow. Empirical equations relating reservoir-storage capacity per mean annual flow to the coefficient of variation were developed. (CSIRO)
W75-11308

2F. Groundwater

HYDROGEOLOGY AND WATER RESOURCES OF MIDDLE KIRKLAND CREEK BASIN, YAVAPAI COUNTY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W75-10872

SUBSURFACE FLOW FROM SNOWMELT TRACED BY TRITIUM,
Swiss Federal Inst. for Snow and Avalanche Research, Davos-Weissfluhjoch.
J. Martinec.
Water Resources Research, Vol 11, No 3, p 496-498, June 1975. 3 fig, 8 ref.

Descriptors: *Subsurface runoff, *Melt water, *Tritium, *Tracers, Groundwater movement, Snow, Runoff, On-site investigations, Infiltration, Discharge(Water), Hydrograph analysis, Lysimeters, Dispersion, Velocity, Radioisotopes, Recession curves.
Identifiers: *Residence time, Radioactive decay.

An explanation was offered of the apparent discrepency between the small velocities of subsurface flow and the watershed response. Environmental tritium in the hydrological cycle provided evidence for a new insight into the runoff mechanism. By this concept the quick reaction of outflow to a massive groundwater recharge was brought to agreement with the long residence time of the infiltrated water. (Visocky-ISWS)
W75-10921

DETERMINATION OF REGIONAL HYDRAULIC CONDUCTIVITY THROUGH USE OF C-14 DATING OF GROUNDWATER,
Geological Survey, Reston, Va.
B. B. Hanshaw, and W. Back.
Reprint from Memoires de l'Association Internationale des Hydrogeologues, Montpellier, France, Vol 10, No 1, p 195-196, September 1974. 3 fig, 7 ref.

Descriptors: *Hydraulic conductivity, *Groundwater movement, *Radioactive dating, *Carbon radioisotopes, Tracers, Hydrogeology.

In order to model and quantify a hydrologic system, one needs to know the boundary conditions, aquifer thickness, and the regional distribution of the hydraulic conductivity. Obtaining sufficient values for the hydraulic conductivity by means of a few pumping tests, core analyses, and tracer tests, so as to be meaningful on a regional scale, has long been a serious constraint on groundwater modeling. However, by using a form of Darcy's law that relates hydraulic conductivity, porosity, gradient of potentiometric surface, and velocity, it is possible to determine hydraulic conductivity if the other variables are known. Porosity can be estimated by standard methods and hydraulic gradient can be obtained directly from the potentiometric surface. Velocity can be calculated from the C-14 ages of carbonate species dissolved in groundwater. The technique of determining regional hydraulic conductivity distribution and solving the equation of groundwater flow was tried in central Florida and gave values of hydraulic conductivity that are in agreement with values obtained by traditional methods. (Knapp-USGS)
W75-10930

GROUND WATER IN THE CORVALLIS-ALBANY AREA, CENTRAL WILLAMETTE VALLEY, OREGON,
Geological Survey, Reston, Va.
F. J. Frank.
Available from Supt. of Documents, GPO, Washington, D.C. 20402, $1.95 in paper copy. Water-Supply Paper 2032, 1974. 48 p, 9 fig, 2 plate, 7 tab, 13 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Hydrologic data, *Oregon, Water wells, Alluvial aquifers, Well data, Drillers logs, Geology, Water supply, Water yield, Water quality.
Identifiers: *Corvallis-Albany area(Ore), Central Willamette Valley(Ore).

The Corvallis-Albany area is part of the alluvial plain that lies between the Cascade and Coast Ranges in the central Willamette Valley in northwestern Oregon. The alluvial deposits (sand and gravel) of the valley plain contain the most productive aquifers in the area and are considered to be the only units feasible for large-scale development of groundwater supplies. During 1971 the seasonal decline of water levels from winter to late summer averaged about 10 feet for the alluvial deposits. The seasonal change of storage was estimated to be about 130,000 acre-feet. Of this volume, about 14,000 acre-feet was pumped from wells; the rest was discharged through seeps and springs by evapotranspiration. The difference between pumpage and natural discharge indicates that a great quantity of additional water is available for development. The storage capacity of the alluvial aquifers is estimated to be about 750,000 acre-feet between depths of 10 and 100 feet. Water from the alluvial deposits is chemically suitable for all uses, as is most of the water from perched-water bodies in the older sedimentary and volcanic rocks. (Woodard-USGS)
W75-10940

RECHARGE AREAS OF THE FLORIDAN AQUIFER IN SEMINOLE COUNTY AND VICINITY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-10944

CONTOUR MAP OF THE BEDROCK SURFACE, NEW BRITAIN QUADRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-10950

MAP SHOWING DEPTH TO BEDROCK, WORTHINGTON QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-10951

MAP SHOWING DEPTH TO BEDROCK, GREENFIELD QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-10952

MAP SHOWING DEPTH TO BEDROCK, CHESTER QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-10953

MAP SHOWING DEPTH TO BEDROCK, MOUNT CARMEL QUANDRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-10954

STUDY OF CRITERIA AND MODELS ESTABLISHING OPTIMUM LEVEL OF HYDROGEOLOGIC INFORMATION FOR GROUNDWATER BASIN MANAGEMENT,
Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
H. O. Pfannkuch.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 719, $6.25 in paper copy, $2.25 in microfiche. Minnesota Water Resources Research Center, Minneapolis, Bulletin No 81, April 1975. 165 p, 27 fig, 4 tab, 94 ref. OWRT A-027-MINN(1).

Descriptors: *Hydrologic data, *Model studies, *Groundwater, *Water management(Applied), Decision making, *Optimization, Simulation analysis, Data collections, Design.
Identifiers: *Sensitivity analysis.

Information is a structural part of the decision making process. The role of the information gathering process can best be described as a Bayes' process to improve preposterior distributions in probability assignments that will serve as basis for decision making processes. Hydrogeologic information is characterized by a low degree of predictability and high variability. The general cost structure of the hydrologic information gathering process is represented in information cost curves which are combined with production cost or opportunity loss curves to give total cost curves. These may display a minimum which is the point of diminishing returns at which exploration activities should be ceased. One of the main unsolved problems is the proper definition of a universally applicable unit of information content. Optimum levels of information can only be established when utility functions can be expressed in monetary terms and give rise to clear objective functions. Three case histories were used to develop guidelines for the design and operation of monitoring systems for special wastes, minimum hydrogeologic information needed in watershed district management, and the need and role of information in the choice and construction of a proposed simulation model for a regional system under complex decision rules. (Waelti-Minnesota)
W75-11042

MANAGEMENT OF RETARDATION OF SALT WATER INTRUSION IN COASTAL AQUIFERS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
A. I. Kashef.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 721, $8.75 in paper copy, $2.25 in microfiche. Completion Report, July 1975. 281 p, 103 fig, 17 tab, 53 ref. OWRT (C-4061)(No 9013)(2).

Descriptors: *Aquifer management, *Artesian aquifers, *Artificial recharge, *Finite element analysis, *Saline water-freshwater interfaces, *Saline water intrusion, Earth dams, Free surface, Groundwater resources, Optimization, Well spacing.
Identifiers: Artesian recharge wells, *Coastal aquifers, Salt water retardation, Finite element mesh, *Hydraulic forces method, Equipotential lines, Freshwater barriers, Rectangular earth sections, Streamlines, Velocity vectors.

The free surface in rectangular earth sections or cores of earth dams were determined by the finite element method using a new technique of horizontally displaced mesh. Ten cases were solved and compared with a previously developed and simpler method in which the hydraulic forces were analyzed and which resulted in closed form mathematical solutions. The comparison indicated that the method of hydraulic forces can satisfactorily be used in artesian aquifers to locate the saline water-freshwater interface which is analogous to the free surface in earth dams. The solved cases corresponded to a wide range of coverage of practical conditions. The effects of recharge wells under the transient flow conditions were then superimposed on these due to the natural flow in order to determine the degree of salt water retardation. Single wells as well as battery of recharge wells parallel to the coast line were analyzed. In all cases, dimensionless parameters were used to allow for the changes in the pump capacities and the time intervals. Various well locations were examined and in the case of well batteries various spacings were introduced. The optimum conditions corresponding to desired degrees of salt water retardation are indicated. Freshwater barriers resulted under certain conditions yet these were outside the scope of this project.
W75-11058

DEPRIVATION CONTRIBUTION AND INTERFERENCE EFFECTS OF MULTIPLE WELLS IN A COMMON AQUIFER,
Oklahoma Univ., Norman. Dept. of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 4B.
W75-11142

URANIUM MINERALIZATION BY GROUND WATER IN SEDIMENTARY ROCKS, JAPAN.
Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan). Raw Materials Div.
K. Doi, S. Hirono, and Y. Sakamaki.
Economic Geology, Vol 70, No 4, p 628-646, June-July 1975. 25 fig, 7 tab, 22 ref.

Descriptors: *Groundwater, *Percolating water, *Leaching, *Mineralogy, Water properties, Groundwater movement, Geology, Rocks, Granites, Sedimentary rocks, Fissures(Geologic), Spring waters, Adsorption, Deposition(Sediments), Petrology.
Identifiers: *Uranium, *Japan, Mineralization, Carbonaceous matter, Ores.

To solve the mechanism of uranium concentration in stratabound uranium deposits occurring in the basal part of Neogene sediments overlying granite basement, attention has been paid to uranium leaching from weathered granite by circulating carbonated fissure waters, to effective adsorbents for fixing uranium from uraniferous groundwaters, to structural features controlling the groundwater circulation, and to other relevant factors. The evidence for uranium transportation by hydrothermal solutions, including hot spring waters, was had to observe. It was concluded: (1) uranium in the deposits is supplied from surrounding source rocks, mostly from granite; (2) uranium is transported by circulating groundwater solutions; (3) the uranium dissolved in graoundwater is fixed in minerals in various ways, the most important being adsorption by carbonaceous matter; (4) ore-grade uranium concentrated from very dilute solutions occurs by multiple repetition of a leaching-and-fixation cycle between minerals or adsorbents and circulation uraniferous groundwater; and (5) important factors for uranium mineralization are sufficient uranium (supplied mostly from granite), the existence of effective adsorbents such as carbonaceous matter in the host rocks, and favorable geological, geochemical, and geophysical environments. The last seem to require not only physical and chemical conditions but also corrent flow and volume of groundwater. (Sims-ISWS)
W75-11145

APPROXIMATION FOR STEADY INTERFACE BENEATH A WELL PUMPING FRESH WATER OVERLYING SALT WATER,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 4B.
W75-11255

GROUND WATER DEPLETION AND SUBSIDENCE PROBLEMS IN TAIPEI BASIN,
National Taiwan Univ., Taipei. Hydraulic Lab.
For primary bibliographic entry see Field 4B.
W75-11262

2G. Water In Soils

BARRENNESS OF DESERT PAVEMENT IN YUMA COUNTY, ARIZONA,
Arizona Univ., Tucson.
H. B. Musick.
Journal of the Arizona Academy of Science, Vol 10, No 1, p 24-28, February, 1975. 2 fig, 2 tab, 20 ref.

Descriptors: *Arid lands, *Sierozems, *Soil analysis, *Soil texture, *Infiltration, Arid climates, Deserts, Semiarid climates, Remote sensing, Aerial photography, Shrubs, Soil investigation, Saline soils, Colloids, Flocculation, *Arizona.
Identifiers: *Desert pavement, Yuma County(Ariz).

Desert pavement, a common feature of many desert areas, is a nearly flat soil surface consisting of a single closely-packed layer of pebbles, generally covered with dark brown desert varnish, and devoid of vegetation. Analysis shows it is usually saline-sodic or sodic. Deflocculation of soil colloids by exchangeable sodium results in low soil infiltration of rainfall and reduces soil moisture supply. The absence of soil moisture seems to be the most important factor preventing the establishment of plant life on the desert pavement soil. (Robinett-Arizona)
W75-10868

SEASONAL VARIATIONS IN THE INFILTRATION RATE OF A WHITEHOUSE SOIL IN SOUTHERN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.

J. G. Medina Torres.
Arizona University, Tucson, Department of Watershed Management, MS Thesis, 1974. 41 p, 9 fig, 6 tab, 1 append, 48 ref.

Descriptors: *Infiltration, *Infiltration rates, *Induced infiltration, *Watershed management, *Range management, *Arizona, Loam, Soil moisture, Rainfall simulators, Soils, Soil types, Soil density, Vegetation, Sands, Seasonal.
Identifiers: *White-house sandy loam, Page-Trowbridge Experimental Ranch(Ariz).

An experiment to test the hypothesis that terminal infiltration rates for a White House sandy loam soil varied with the seasons of the year was undertaken at the Page-Trowbridge Experimental Ranch in southern Arizona. Infiltration rates were estimated during the winter, early spring, and early summer of 1974. Simulated rainfall was applied to plots one-thousandth of an acre in size by using the Rotadisk Rain-ulator. Antecedent soil moisture and soil bulk density were measured and vegetation growth stage recorded at the time of each infiltration run. Cover measurements were made at the last infiltration run of all plots. Non-significant differences influenced by the season of the year were found in the terminal infiltration rates. However, there was a consistent decrease of antecedent soil moisture from January to June. (McLeachlan-Arizona)
W75-10873

MANAGEMENT OF SOUTHWESTERN DESERT SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
W. H. Fuller.
University of Arizona Press, Tucson. 1975. 195 p, 59 fig, 28 tab.

Descriptors: *Sierozems, *Soil management, *Arid lands, *Soil-water-plant relationships, *Soil chemical properties, *Soil physical properties, Soil environment, Soil texture, Soil treatment, Rainfall, Soil aggregates, Flocculation, Wettability, Soil microorganisms, Soil amendments, Fertilizers, Organic matter, Soil analysis, Salinity, Soil structure, Soil compaction, Compacted soils, Puddling, Land reclamation, Soil water, Soil water movement, Soil stabilization.

In arid climates, soils are under stresses of irrigation water that is high in salt content, of a high evaporation rate from surfaces with concurrent upward movement of salts by capillary action, and of high water demand by plants to accommodate heavy transpiration losses under desert conditions. Southwestern desert soil profiles are explained, and the functions, composition, sources, management and maintenance of organic matter in soils are discussed. The need for and practical uses of nutrients and fertilizers are outlined with emphasis on individual chemical and physical properties. Management of arid lands including reclamation techniques, salinity control and water use is outlined. Soil and water conservation, both essential to arid soil management, are emphasized. Techniques for testing desert soil, water, and plants are presented. (Michael-Arizona)
W75-10877

SOILS OF THE DESERT SOUTHWEST,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
W. H. Fuller.
University of Arizona Press, Tucson. 1975. 102 p, 60 fig, 6 tab.

Descriptors: *Southwest US, *Sierozems, *Arid lands, *Soils, *Soil classification, *Soil surfaces, *Soil investigations, *Soil physical properties, Soil chemical properties, Soil chemistry, Soil environment, Soil erosion, Soil formation, Soil horizons, Soil profiles, Soil properties, Soil structure, Soil texture, Soil types.

The characteristics of desert soils in the southwestern United States are contrasted and compared with soils for more humid climates. An overview is presented of the physical characteristics, vegetation, and human impact on desert soils. Physical makeup of desert soils, including mineral and organic matter and soil matter and air content is explained. The soil forming features of the desert (climate, vegetation, topography, parent material and time) are discussed individually and their interaction under certain conditions is elaborated. Topsoil appearance and subsurface structure are explained in relation to mineral content, weathering and the desert fauna which exist in the soil. The last chapter demonstrates how to classify soils into groups and the appendix gives soil classification and nutrient cycle charts. (Miller-Arizona)
W75-10878

SOIL MORPHOLOGY AND SOIL PHYSICAL PROPERTIES: II. MECHANICAL IMPEDANCE AND MOISTURE RETENTION AND MOVEMENT,
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
K. W. Ayres, R. G. Button, and E. De Jong.
Canadian Journal of Soil Science, Vol 53, No 1, p 9-19, 1973. Illus.

Descriptors: *Soil physical properties, *Moisture content, Soil structure, Soil mechanics, Soil horizons, *Soil density, Chernozems, Porosity, Regression analysis, Hydraulic conductivity, Bulk density.
Identifiers: Solonetzic soils, *Soil mechanical impedance.

The relations among soil structure, soil mechanical impedance and moisture retention and movement were investigated on undisturbed soil cores from soil horizons exhibiting 6 distinct kinds of soil structure (prismatic, columnar, blocky, granular, platy, massive) over a broad range of soil texture. Mechanical impedance was characterized by measurements of bulk density and soil strength. Moisture retention and movement were characterized by measurements of 1/3-atm moisture content and saturated hydraulic conductivity. The columnar structures from Solonetzic soils were singled out as having a higher mechanical impedance and lower hydraulic conductivity than the other structures, most of which were sampled from Chernozemic soils. Total porosity (P) and bulk density (Db) were highly correlated; however, the regression coefficient for P vs. Db for columnar structures was significantly higher than that found for the other 5 structural types. Regression equations predicted that the hydraulic conductivity of platy structures could be zero for samples having as much as 15% air-filled pore space at 1/3-atm suction as compared with 6-8% for the other structures.--Copyright 1973, Biological Abstracts, Inc.
W75-10885

USE OF AMENDMENTS TO REDUCE WATER REQUIREMENTS FOR STAND ESTABLISHMENT OF SMALL-SEEDED CROPS,
Arizona Univ., Tucson. Dept. of Plant Sciences.
For primary bibliographic entry see Field 3F.
W75-11045

MOISTURE AND ENERGY CONDITIONS IN A DRAINING SOIL MASS,
Georgia Univ., Athens. School of Forest Resources.
W. L. Nutter.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 726, $4.75 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No ERC-0875, June 1975. 88 p, 15 fig, 4 tab, 26 ref. OWRT A-025-GA(2), 14-31-0001-3510.

Descriptors: Watersheds(Basins), *Forest watersheds, *Recession curves, Subsurface drainage, *Soil water movement, Percolation, Soil properties, Subsurface flow, Unsaturated Flow, Tensiometers, *Subsurface runoff, Model studies, Slopes, Soil moisture, Moisture content, Energy, Drainage.
Identifiers: *Hillside drainage, Matric potential, Soil mass.

A 6.1 m long, 1.2 m deep and 0.3 m wide soil model was constructed in the laboratory. The model may be mechanically raised from the horizontal to a 27-degree angle. The model was packed with a mixed subsurface horizon soil composed of 51 percent sand, 21 percent silt and 28 percent clay. The objective was to study the effects of slope angle and soil depth on the moisture and energy conditions within a draining soil mass and their relationship to streamflow depletion. Three slopes (25, 15, and 5 degrees) were drained at three depths (120, 80 and 40 cm), a total of nine drainage sequences. As drainage continues the equipotential lines of hydraulic head approach a position normal to the surface. The degree of divergence from normal increases with decrease in slope angle. Water content gradients suggest that a zone of active water movement migrates downslope during drainage and may migrate back upslope during the input of rainfall. The zone may identify the limits of source areas during stormflow. Of the variables studied, slope angle exerts the greatest influence over the nature of drainage from a soil mass. Response of a moderately step and moderately deep slope will be similar to that of a steep and deep slope.
W75-11054

LIMITATIONS OF USING A SIMULATION MODEL OF THE SOIL UNDER IRRIGATED CULTIVATION TO SIMULATE THE FUNCTIONING OF THE SOIL AS A PURIFYING SYSTEM (LIMITES D'UTILISATION D'UN MODELE DE COMPORTEMENT DU SOL SOUS CULTURE IRRIGUEE POUR SIMULER LE FONCTIONNMENT DU SOL COMME SYSTEME EPURATEUR),
Institut National de la Recherche Agronomique, Versailles (France). Soils Lab.
For primary bibliographic entry see Field 5B.
W75-11125

THE USE OF SOIL AS A PURIFYING SYSTEM (L'UTILISATION DU SOL COMME SYSTEME EPURATEUR),
Institut National de la Recherche Agronomique, Dijon (France). Laboratoire de Microbiologie des Sols.
For primary bibliographic entry see Field 5D.
W75-11126

SOIL MAP OF THE WORLD, 1:5,000,000, VOLUME IV, SOUTH AMERICA.
Food and Agricultural Organization of the United Nations, Rome (Italy); and United Nations Educational, Scientific, and Cultural Organization, Paris (France).
For primary bibliographic entry see Field 7C.
W75-11138

AVAILABLE WATER-HOLDING CAPACITIES OF SOILS IN SOUTHERN IDAHO,
Idaho Agricultural Experiment Station, Aberdeen.
R. E. McDole, G. M. McMaster, and D. C. Larsen.
Current Information Series No 236, June 1974. 4 p, 2 fig, 3 tab.

Descriptors: *Soil moisture, *Available water, *Retention, *Idaho, Root zone, Soil-water-plant relationships, Wilting point, Moisture content, Field capacity, Subsurface waters, Soils, Soil physical properties, Soil water, Soil texture, Soil types, Laboratory tests, Infiltration, Agriculture.
Identifiers: *Available water-holding capacities.

To manage moisture on agricultural cropland, one must know how much water and soil profile can hold and store for plant use. This is called the available water-holding capacity of the soil and is usually expressed as inches of water per foot of soil depth. The available water-holding capacity of any soil can be calculated from: (1) the thickness of the horizons that make up the soil profile, and (2) the moisture characteristics of these horizons. The first of these - the kind, arrangement and thickness of soil horizons - can be determined by examining the soil profile. The second factor, the moisture characteristics of these horizons, can be determined by laboratory analyses. Laboratory studies that determined water-holding capacities of specific soils (soil series) and soil texture classes in southern Idaho were reported. Samples for this study were collected from agricultural areas across southern Idaho. Each of the samples was analyzed in laboratory pressure chambers to determine water-holding capacity values. A method called ceramic plate extraction was used to establish a desorption curve for each sample. These curves were the basis for determining the permanent wilting point and field capacity. These values, in turn, were used to calculate available water-holding capacity for each soil. (Sims-ISWS)
W75-11140

CHANGES IN VEGETATION AND SURFACE SOIL PROPERTIES FOLLOWING IRRIGATION OF WOODLANDS WITH MUNICIPAL WASTEWATER,
Michigan State Univ., East Lansing. Dept. of Forestry.
For primary bibliographic entry see Field 5B.
W75-11243

2H. Lakes

EPIFAUNAL INVERTEBRATES AS INDICATORS OF WATER QUALITY IN SOUTHERN LAKE PONTCHARTAIN,
New Orleans Univ., La. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W75-10852

LIMNOLOGY OF DESERT PONDS,
Arizona Univ., Tucson. Dept. of Biological Sciences.
S. R. Alcorn.
Arizona University, Tucson, Department of Biological Sciences, MS Thesis, 1974. 45 p, 3 fig, 6 tab, 31 ref, 2 append.

Descriptors: *Limnology, *Ponds, *Fisheries, *Warm-water fish, *Arizona, Water properties, Sampling, Water sampling, Data collections, Water analysis, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Aquatic plants, Euphotic zone, Thermal stratification.
Identifiers: Photic zone.

The limnology of five types of ponds in Southern Arizona was studied from October 1972 to September 1973 to provide information for the use of ponds as fisheries. Temperature, oxygen, pH, and photic zone measurements were made monthly. Diel studies of temperature, oxygen, and pH were conducted in July. Weather conditions caused thermal stratification to begin in February and last through October in deeper ponds. Complete nightly summer circulation occurred in most ponds. Shaded ponds were no cooler than open ponds. Winter oxygen concentrations were above 5 mg/l in all ponds. Winter oxygen concentrations were suitable for warm-water fish year round and trout from November through April. The best type of ponds were those filled with well water rather than those supplied by runoff. (McLachlan-Arizona)
W75-10880

SOME LIMNOLOGICAL CHARACTERISTICS OF ARIVACA LAKE IN SOUTHERN ARIZONA,
Arizona Univ., Tucson.
J. C. Tash, and C. D. Ziebell.
Journal of the Arizona Academy of Science, Vol 10, No 1, p 8-14, February 1975. 4 fig, 3 tab, 11 ref.

Descriptors: *Arizona, *Limnology, *Aquatic environment, *Sport fishing, *Lake fisheries, *Artificial lakes, Lakes, Water temperature, Dissolved oxygen, Light penetration, Benthos, Aquatic microorganisms, Zooplankton, Aquatic life, Water sampling, Organic matter, Fish, Fish management.
Identifiers: *Arivaca Lake(Ariz).

Scarcity of water in Southern Arizona gives premium value to all waters that provide aquatic-related recreation. Larger lakes, all of which are manmade, receive particularly heavy recreational use primarily in the form of sport fishing. Value and use of these lakes for sport fishing are directly related to the quality and productivity of the water. Data are presented on temperature, dissolved oxygen, zooplankton, and benthos for Arivaca Lake, the most recently constructed of four large manmade lakes. These data can be used for future studies that will improve management of fisheries in other Southern Arizona lakes. (Robinett-Arizona)
W75-10891

TWO-DIMENSIONAL, HYDROSTATIC SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS,
Stanford Univ., Calif. Dept. of Civil Engineering.
B. R. Roberts, and R. L. Street.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 535, $6.25, in paper copy, $2.25 in microfiche. Technical Report No. 194, July 1975. 162 p, 32 fig, 6 tab, 32 ref, 2 append. OWRT C-3033(No 3675)(1).

Descriptors: *Thermal pollution, *Thermal stratification, *Lakes, *Computer programs, *Computer models, *Reservoirs, Numerical analysis, Digital computers, Simulation analysis, Currents(Water), Circulation, Thermocline, Equations, Model studies.

The study led to a simplified and two-dimensional, numerical model capable of representing stratification and thermally unstable flows in lakes. The Navier-Stokes equations, a heat balance equation, the continuity equation, and an equation relating fluid density to temperature are combined to form a closed system. The Boussinesq approximation is used; a hydrostatic pressure distribution is assumed. A sub-grid-scale turbulence model provides a variable eddy viscosity for diffusion calculations. The numerical model follows a Marker-and-Cell-style format in variable placement, upstream differencing was used for convection terms, and FORTRAN is the program language. The model was implemented for use on an IBM 370/168. Favorable comparisons with other models were obtained. A long-term, large-scale stratification process was simulated and quantitative agreement with laboratory experiments was obtained. -
W75-10901

CONCURRENT NITRIFICATION-DENITRIFICATION AT THE SEDIMENT-WATER INTERFACE AS A MECHANISM FOR NITROGEN LOSSES FROM LAKES,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W75-10902

A COMPUTER PROGRAM PACKAGE FOR AQUATIC ECOLOGISTS,
Cornell Univ., Ithaca, N.Y.
P. J. Godfrey, L. White, and E. Keokosky.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 508, $4.25 in paper copy, $2.25 in microfiche. Technical Report 95, Cornell University Water Resources and Marine Sciences Center, Ithaca, New York, April 1975. 48 p, 2 fig, 1 tab, 4 ref, 1 append. OWRT A-047-NY(2) and B-038-NY(2).

Descriptors: *Aquatic life, *Ecology, *Computer programs, *Data collections, Computers, Lakes, Water quality, Depth, Phytoplankton, Temperature, Water chemistry, Biological properties, Carbon dioxide, Dissolved oxygen.
Identifiers: Data reduction, Pigment ratios.

Aquatic ecology frequently requires the collection of large amounts of field data. These data can be condensed into a manageable and meaningful form using a computer. Several computer programs developed to meet the specialized needs of data common to aquatic ecology are presented. These programs are useful for data reduction and arrangement, and several have been designed to produce output for subsequent use in available statistical program packages. They are flexible and basically simple, thus having wide applicability and appeal to the computer novice. The programs are classified into three groups: (1) generalized programs applicable to many forms of limnological data -- INTEGRATE, and AVERAGE; (2) specialized programs for chemical data--CO2 and D.O. SAT, and PIGMENT RATIO; and (3) specialized programs for biological data--SPECIES, and SUCCESSION. The programs are written in Fortran IV, except for SPECIES which is written in PL/I. All have been run on an IBM 360 and IBM 370, but conversion to other systems should not be difficult. The programs are described in detail, and an appendix includes program listings and examples of the outputs. (Bell-Cornell)
W75-10908

A SIMPLE AND INEXPENSIVE TECHNIQUE FOR DETERMINING COLORED LIGHT INTENSITY UNDERWATER,
Genesee Community Coll., Batavia, N.Y. Mathematics and Science Div.
For primary bibliographic entry see Field 7B.
W75-10919

WIND EFFECTS ON CHEMICAL FILMS FOR EVAPORATION SUPPRESSION AT LAKE HEFNER,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3B.
W75-10920

THE GEOCHEMICAL CYCLE OF ARSENIC IN LAKE WASHINGTON AND ITS RELATION TO OTHER ELEMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W75-10922

ROOT:SHOOT AND LEAF AREA RELATIONSHIPS OF MACROPHYTE COMMUNITIES IN CHAUTAUQUA LAKE, NEW YORK,
State Univ. Coll., Fredonia, N.Y. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-11009

UTILIZATION OF STREAM-BORNE PHOSPHORUS BY CAYUGA LAKE PHYTOPLANKTON,
New York State Coll. of Agriculture and Life Sciences, Ithaca, N.Y. Ecology and Systematics Section.
For primary bibliographic entry see Field 5C.
W75-11036

PRELIMINARY INVESTIGATIONS INTO COPPER CYCLING IN INDIAN LAKE, MAS-

SACHUSETTS: A LAKE TREATED ANNUALLY WITH COPPER SULFATE,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W75-11039

HYDRAULIC MODELING OF MIXING PHENOMENA IN STRATIFIED LAKES,
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
P. M. Moretti, and D. K. McLaughlin.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 725, $3.75 in paper copy, $2.25 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, 1975. 33 p, 16 fig, 1 tab, 11 ref. OWRT A-050-OKLA(3).

Descriptors: *Lakes, *Mixing, *Dispersion, *Stratification, *Hydraulic models, *Stratified flow, Density stratification, Flow characteristics, Model studies, *Oklahoma.
Identifiers: Richardson number, Vertical dispersion, Horizontal dispersion, Ham's Lake(Okla).

The objective was to provide criteria for laboratory modeling of stratified lake flows. Consideration was given to fluid inflows and to flows generated by a mechanical destratification device. The inflow experiments were designed to investigate the effects of scale distortion since vertical scale exaggeration is necessary in laboratory size models, to offset the increased viscous forces that accompany the size reduction. Experiments were performed in two inflow lake models which are identical in horizontal dimensions but differ by a factor of two in the vertical dimensions. Density profiles and dye front flow visualization records were made of inflows over a range of flow parameters. It was established that a vertically exaggerated model of a stratified lake flow cannot replicate all the details of the mixing process. However, vertical dispersion alone can be accurately modeled in a distorted model of an inflow in a stratified basin if the overall Richardson number is used as the modeling parameter. Similarly horizontal dispersion can be accurately modeled if a modification of Richardson number is used as the basic modeling parameter. A vertically exaggerated model of Ham's lake was constructed and experiments were made of the mechanical destratification of the model. Surprisingly accurate modeling of the prototype destratification experiments was achieved with the model. The appropriate nondimensional parameter is the overall Richardson number and the characteristic time used to nondimensionalize the mixing times was the volume of the lake divided by the volume flow rate of the pump.
W75-11043

BIOCHROME ANALYSIS AS A METHOD FOR ASSESSING PHYTOPLANKTON DYNAMICS, PHASE II,
Arkansas Univ., Fayetteville. Dept. of Botany and Bacteriology.
For primary bibliographic entry see Field 5C.
W75-11052

SOME RESULTS ON MASS TRANSFER PROCESSES IN A DENSITY-STRATIFIED FLOW,
Mississippi Univ., University. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W75-11057

SOUTH AFRICAN EUTROPHICATION PROBLEMS: A PERSPECTIVE,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5C.
W75-11131

DISSOLVED ORGANIC MATTER AND LAKE METABOLISM,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 5C.
W75-11188

INVESTIGATION OF THE INFLUENCE OF THERMAL DISCHARGE FROM A LARGE ELECTRIC POWER STATION ON THE TEMPERATURE AND NEAR-SHORE CIRCULATION OF LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 5C.
W75-11190

AQUATIC PLANT CONTROL ON LAKE CORPUS CHRISTI,
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 5G.
W75-11194

PRIMARY PRODUCTION IN LAKES ONTARIO AND ERIE: A COMPARATIVE STUDY,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-11217

MICROBIOLOGICAL EXAMINATION OF OFFSHORE LAKE ERIE SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-11218

APPLICATION OF THE MANOMETRIC TECHNIQUE IN THE STUDY OF SEDIMENT OXYGEN DEPLETION,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-11222

THE EFFECTS OF THE FORMATION OF LAKE KAINJI (NIGERIA) UPON THE INDIGENOUS FISH POPULATION,
Ife Univ. (Nigeria). Kainji Dam Research Project.
For primary bibliographic entry see Field 5C.
W75-11223

ACID STRIP MINE LAKE RECOVERY,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W75-11224

THE GROWTH OF SOME EPIPHYTIC ALGAE IN A LAKE RECEIVING THERMAL EFFLUENT,
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W75-11225

IN SITU MEASUREMENT OF THE SETTLING VELOCITY PROFILE OF PARTICULATE ORGANIC CARBON IN LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-11227

A GENERAL DESCRIPTION OF THE OLIGOTROPHIC LAKE PAAJARVI, SOUTHERN FINLAND, AND THE ECOLOGICAL STUDIES ON IT,
Helsinki Univ. (Finland). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W75-11229

MAN'S IMPACT ON A NEWLY FORMED RESERVOIR,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-11233

EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. IV. FEEDING OF INTRODUCED AND AUTOCHTHONOUS NON-PREDATORY FISH,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W75-11234

A CONTRIBUTION TO THE BIOLOGY OF NITELLA HOOKERI A. BR. IN THE ROTORUA LAKES, NEW ZEALAND. II. ORGANIC NUTRIENTS AND PHYSICAL FACTORS,
Auckland Univ. (New Zealand). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W75-11235

SEDIMENT PROCESSES IN GREAT LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W75-11237

SEASONAL ABUNDANCE OF CRUSTACEAN ZOOPLANKTON AND NET PLANKTON BIOMASS OF LAKES HURON, ERIE, AND ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-11238

THE UTILIZATION OF SUN-GLINT IN A STUDY OF LAKE DYNAMICS,
Canada Centre for Inland Waters, Burlington(Ontario).
For primary bibliographic entry see Field 5A.
W75-11239

PRELIMINARY INFORMATION ON THE NATURE OF ORGANIC MATTER IN THE SURFACE SEDIMENTS OF LAKES HURON, ERIE, AND ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W75-11240

QUANTITATIVE ESTIMATION OF THE DAILY INGESTION OF PHYTOPLANKTON BY TILAPIA NILOTICA AND HAPLOCHROMIS NIGRIPINNIS IN LAKE GEORGE, UGANDA,
Queensland Univ., Brisbane (Australia). Dept. of Zoology.
C. M. Moriarty, and D. W. J. Moriarty.
J Zool Proc Zool Soc Lond, Vol 171, No 1, p 15-23, 1973, Illus.

Descriptors: *Phytoplankton, Lakes, *Digestion, Herbivores, *Fish, Africa.
Identifiers: *Haplochromis-nigripinnis, *Tilapia-nilotica, *Uganda(Lake George).

A direct method was used to estimate the amount of phytoplankton ingested per day by herbivorous fish in Lake George, Uganda. The quantities ingested are linearly related to the weight of the fish, as given by the following regression equations: for Tilapia nilotica: $y = 271 + 13.3\ x$ and for Haplochromis nigripinnis: $y = -29.6 + 21.9\ x$, where y is the dry weight of photoplankton (mg) ingested per day and x is the wet weight of the fish (g).--Copyright 1974, Biological Abstracts, Inc.

W75-11268

THE MEASUREMENT AND ESTIMATION OF LAKE EVAPORATION FROM FOUR AUSTRALIAN WATER STORAGES,
Bureau of Meteorology, Melbourne (Australia).
For primary bibliographic entry see Field 2D.
W75-11300

SEASONAL ABUNDANCE AND DIVERSITY OF BENTHOS IN A SOUTHERN ILLINOIS, USA SWAMP,
Central Michigan Univ., Mt. Pleasant. Dept. of Biology.
J. N. Krull, and W. A. Hubert.
Nat Hist Misc. 190. p 1-4, 1973.

Descriptors: *Benthos, *Illinois, Seasonal, Invertebrates, *Swamps, *Benthic fauna, Organic matter, Oxygen, Environmental effects, *Aestivation, Summer, Wetlands.
Identifiers: *Pine Hill Swamp(Ill).

The benthic invertebrate fauna of a portion of the Pine Hills Swamp (Illinois, USA) exhibited extreme seasonal fluctuations in both abundance and diversity. The dominant benthos was characterized by organisms tolerant of high concentrations of organic material and low O2 levels, as well as possessing aestivation capabilities or life cycle adaptations to overcome severe midsummer environmental conditions.--Copyright 1974, Biological Abstracts, Inc.
W75-11312

2I. Water In Plants

PHENOLOGY OF SELECTED SONORAN DESERT PLANTS AT PUNTA CIRIO, SONORA, MEXICO.
Arizona Univ., Tucson. Dept. of Biological Sciences.
R. R. Humphrey.
Journal of the Arizona Academy of Science, Vol 10, No 1, p 50-67, February, 1975. 1 fig, 2 tab, 7 ref.

Descriptors: *Phenology, *Mexico, *Plant growth, *Arid climates, *Soil-water-plant relationships, *Desert plants, Biorhythms, Environmental effects, Growth stages, Precipitation(Atmospheric), Seasonal, Climatic data, Weather data, Shrubs, Semiarid climates, Soil moisture, Flowering, Vegetation, Cacti, Arid lands.
Identifiers: Punta Cirio(Mexico), Sonora(Mexico), Baja California(Mexico).

Phenological changes observed at Punta Cirio within an approximate 50 meter radius and no more than 100 meters from the Gulf of California coast were evaluated. Seasonal patterns are evident, particularly with respect to certain taxa, but the important controlling factor may be available moisture rather than temperature or other seasonal variables. Most of the vegetation is comprised of various shrubs, half-shrubs and cacti. Phenological data are presented for 20 Sonoran Desert species. (Robinett-Arizona)
W75-10862

THE EARLY VEGETATIVE GROWTH OF TWO ANNUAL PASTURE GRASSES (HORDEUM LEPORINUM LINK AND LOLIUM RIGIDUM GAUD.),
South Australia Dept. of Agriculture, Adelaide.
For primary bibliographic entry see Field 3F.
W75-10876

ESTABLISHING ALKALI SACATON ON HARSH SITES IN THE SOUTHWEST,
Forest Service, (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.

W75-10882

PRODUCTS FROM JOJOBA: A PROMISING NEW CROP FOR ARID LANDS.
National Research Council, Washington, D.C. Committee on Jojoba Utilization.
For primary bibliographic entry see Field 3F.
W75-10890

THE GERMINATION AND ESTABLISHMENT OF TWO ANNUAL PASTURE GRASSES (HORDEUM LEPORINUM LINK AND LOLIUM RIGIDUM GAUD.),
South Australia Dept. of Agriculture, Adelaide.
P. S. Cocks, and C. M. Donald.
Australian Journal of Agricultural Research, Vol 24, No 1, p 1-10, January 1973. 1 fig, 7 tab, 9 ref.

Descriptors: *Soil-water-plant relationships, *Grasses, *Germination, *Seeds, *Plant growth, Soaking, Wetting, Drying, Soil surfaces, Loam, Vegetation establishment, Soil water, Absorption, Water injury, Grasslands, Pastures, Osmotic pressure, Moisture stress, Plant physiology, Seed treatment.
Identifiers: Hordeum leporinum Link, Lolium regidum Gaud.

Studies under controlled conditions show that Hordeum leporinum Link germinates more quickly than Lolium rigidum Gaud. at all temperatures. Lolium requires alternating temperatures for maximum germination; Hordeum shows little response to temperature variation. Germination of both species is depressed at temperatures above 30C and inhibited at 36C and above. Soaking Hordeum seeds for 10 hours and Lolium for 18, then drying and rewetting seeds stimulates germination of both species. Longer soaking depresses germination rates. Controlled experiments on soil surface show Hordeum better able to germinate with small amounts of water. Absorption studies indicate water uptake of seeds is identical for both species. Hordeum was able to germinate in solutions of higher osmotic pressure than was Lolium. (Michael-Arizona)
W75-10897

ENVIRONMENTAL IMPACT EVALUATION IN FRESHWATER IMPOUNDMENTS BY VEGETATION ANALYSIS OF THE TERRESTRIAL ECOSYSTEM,
Massachusetts Univ., Amherst. Water Resources Research Center.
P. W. Fairbairn, and C. A. Carlozzi.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 505, $6.25 in paper copy, $2.25 in microfiche. Publication No. 49, Completion Report FY-75-4, April 1975. 141 p, 22 tab, 37 fig, 18 append, 27 ref. OWRT A-053-MASS(1). 14-31-0001-4021.

Descriptors: Evaluation, *Environmental effects, Vegetation, *Ecosystems, *Ecology, Rivers, Floods, *Floodwater, Management, Impoundments, *Vegetation effects, *Massachusetts, Damsites.

The objective was to develop and test a method of analyzing the ecological impact of artificially impounded floodwaters on the terrestrial environment. The approach was to apply techniques of field ecology to three similar river systems each subject to a different management regimen, with a view to determining levels of relative community stability in terms of successional maturity. Degree of environmental impact was described in terms of vegetative characteristics correlated with elevation, including life form, species dominance, diversity indices, biomass, seasonal distribution of flowering, method of seed dispersal, and number of exotics and annuals present. Emphasis was on community rather than single-species attributes. These characteristics were correlated negatively or positively in a consistent fashion with degree of flooding intensity. A composite graph was drawn up displaying in an additive way nine vegetative characteristics. By this means it was possible to show the cumulative impact of flooding across a vertical range of 60 feet. On the strength of the characteristics used it was considered possible to define the relative levels of community stability at each of the three rivers studied, at different levels of flooding stress.
W75-10905

EFFECT OF SOIL-WATER RELATIONS ON THE ROOT POROSITY, TRANSPIRATION AND ION UPTAKE IN RICE,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W75-10916

SPECIES DIVERSITY OF BENTHIC MACROINVERTEBRATES AND LIMNOLOGICAL CONDITIONS IN A 1ST ORDER MOUNTAIN STREAM,
Bradley Univ., Peoria, Ill. Dept. of Biology.
B. J. Mathis.
Trans Ill State Acad Sci, Vol 66, No 3/4, p 29-32, 1973. Illus.

Descriptors: *Invertebrates, *Benthos, Streams, *Bogs.
Identifiers: Limnological studies, *Mountain streams, *Species diversity, Sphagnum bogs.

Limnological conditions and species diversity were determined in a 1st order spring-fed mountain stream flowing through a sphagnum bog. Aquatic invertebrates (36 spp.) representing 7 orders were collected during the study. Species diversity, and redundancy were similar to 4th order downstream stations.--Copyright 1974, Biological Abstracts, Inc.
W75-10918

SEASONAL VARIATION IN COMPOSITION, PLANT BIOMASS, AND NET PRIMARY PRODUCTIVITY OF A TROPICAL GRASSLAND AT KURUKSHETRA, INDIA,
Kurukshetra Univ. (India). Dept. of Botany.
J. S. Singh, and P. S. Yadava.
Ecol Monogr. Vol 44, No 3, p 351-376, 1974, Illus.

Descriptors: *Seasonal, *Primary productivity, *Biomass, *Grasslands, Vegetation, Distribution, Water pollution effects.
Identifiers: *India(Kurukshetra), *Tropical grasslands.

The variation in composition, plant biomass and net primary productivity was analyzed in a tropical grassland situated within the campus of the Kurukshetra University, India, at 29 deg 58' N latitude and 76 deg 51' E longitude. A study of life forms indicated a therocryptophytic flora. Detailed phytosociological values of constituent species of the vegetation were studied at monthly intervals (May 1970-May 1971) through tiller analysis. Most of the species were found to be contagiously distributed. The changes throughout the year in the aboveground plant biomass, standing dead, litter, and belowground biomass showed a maximum aboveground biomass in Sept. (1974 g/sq m) and maximum belowground biomass in Nov. (1167 g/sq m). Examination of vertical distribution of the aboveground biomass of total vegetation as well as of the individual species indicated that different layers of vegetation are dominated by different species in different months. The aboveground net primary production was maximum during the rainy season (1706 g/sq m), and the belowground maximum occurred during the winter season (785 g/sq m). Total annual net primary production is estimated to be 3538 g/sq m. The system transfer functions revealed that productivity was more aboveground-directed dur-

ing the wet period and more belowground-directed during the dry period. Annual efficiency of energy capture by the primary producers was calculated to be 1.66% on the basis of half total incident solar radiation.--Copyright 1974, Biological Abstracts, Inc.
W75-11006

VEGETATION, SOIL, AND CLIMATE ON THE GREEN MOUNTAINS OF VERMONT,
Yale Univ., New Haven, Conn. School of Forestry.
T. G. Siccama.
Ecol Monogr, Vol 44, No 3, p 325-349, 1974. Illus.

Descriptors: *Vermont, Climates, *Vegetation, Soils, *Beech, *Maple, *Forests, *Soil moisture, Trees.
Identifiers: *Green Mountains(Vt), Boreal Forest(Vt).

The Appalachian extension of the Boreal Forest, dominated by balsam fir, red spruce and white birch, extends down the slope of the Green Mountains to about 2600 ft (792 m), where it merges with the Eastern Deciduous Forest dominated by sugar maple, beech and yellow birch. These 2 forest formations occur well-developed horizontal bands on the mountains, with a distinctive tension zone forest between them. In this midslope forest, the species of neither the deciduous nor boreal forest are able to form well-developed long-lived stands. The contact between the deciduous and boreal forest is climatically, not edaphically, controlled. The current vegetation and soil development is the result of the long-term effects of a vertical climatic discontinuity expressed as a nonlinear decline in the length of the forest-free period across the midslope transitional forest and as a marked increase in the frequency of the cloud base at and above ca. 792 m. This results in increased moisture from fog drip and frequent occurrence of hoar frost in winter. The sharp decrease in the length of the growing season, together with marked changes in icing and atmospheric moisture conditions, limits the upward extension of the beech-maple forest.--Copyright 1974, Biological Abstracts, Inc.
W75-11021

STUDIES ON THE RELATIONSHIP BETWEEN DRY-MATTER PRODUCTION AND THE DEVELOPMENT OF A PINE FOREST ON COASTAL SAND DUNES (I), (IN JAPANESE),
Tottori Univ. (Japan). Dept. of Forestry Management.
For primary bibliographic entry see Field 4A.
W75-11098

A SURVEY OF FISHES AND COMMERCIAL INVERTEBRATES OF THE NEARSHORE AND ESTUARINE ZONE BETWEEN CAPE ROMANO AND CAPE SABLE, FLORIDA,
National Marine Fisheries Service, Panama City, Fla. Gulf Coastal Fisheries Center.
W. N. Lindall, J. R. Hall, W. A. Fable, and L. A. Collins.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 215, $4.25 in paper copy, $2.25 in microfiche. South Florida Environmental Project, Ecological Report No DI-SFEP-74-44, July 1973. 66 p, 8 fig, 2 tab, 26 ref.

Descriptors: *Florida, *Marine fish, *Fisheries, *Neritic, *Estuaries, Gulf of Mexico, Baseline studies, Deep water, Shallow water, Distribution, Coral, Surveys.
Identifiers: *Cape Romano(Fla), *Cape Sable(Fla), Sponges.

The nearshore and estuarine waters of southwestern Florida, particularly Florida Bay and adjacent areas, provide feeding and nursery grounds for the young of many species of fish and shellfish. The multimillion dollar pink shrimp fishery of the Sanibel and Tortugas grounds is an outstanding example of production derived from this zone. Until comparatively recently the fish fauna of this region were poorly known. Baseline data were compiled on fishes inhabiting the estuarine and nearshore waters between Cape Romano and Cape Sable. Increasing conflicts of interest between the forces of conservation and those of development point to the immediate need for comprehensive evaluation of this area. Fish and commercial invertebrates taken at each station are tabulated. Nearly 32,000 finfish representing 114 species were collected. Fifty-five species were of commercial value and 24 of sport value. Over 2800 individuals of six species of commercial invertebrates were collected. Nomenclature and sequence of fishes are given in the annotated list. Environmental data where each species was collected are summarized. Salinity, water temperature or range, water depth or range, and bottom type or range are given. Sponges and hard or soft corals were also noted. (Jones-Wisconsin)
W75-11189

THE AQUATIC WEED PROBLEM. 1. IDENTIFICATION,
Victoria State Coll., Carlton (Australia). Dept. of Plant Physiology.
F. Eady.
New Zealand Journal of Agriculture, Vol 129, No 2, p 40, 41, 43, 45, 1974. 5 fig.

Descriptors: *Aquatic weeds, *Aquatic plants, *Varieties, Plant groupings, Floating plants, Rooted aquatic plants, Submerged plants, Water hyacinth, Pondweed, Foreign countries, Drainage systems.
Identifiers: *New Zealand, Duckweed, Water ferns, Azolla rubra, Azolla pinnata, Salvinia herzogii, Lemna minor, Wolffia arrhize, Spirodela oligorhhiza, Elodea canadensis, Lagarosiphon major, Egeria densa.

Of 34 aquatic weed species which cause problems in New Zealand, 29 are importations. Three broad groups consist of free-floating, submergent, and emergent species. The free-floating weeds are water ferns (Azolla and Salvinia), duckweeds, and water hyacinth. Two Azolla species can be identified by their roots: Azolla rubra roots hang straight down and are unbranched; Azolla pinnata roots branch and have fine hairs. Azolla rubra develops a deep red-brown color. The leaves of Azolla pinnata are more pointed. They reproduce rapidly so are difficult to eradicate. Salvinia herzogii is a brownish-green plant with folded hairy leaves. Three species of duckweed are found. Lemna minor has only one root per green frond. Spirodela oligorhhiza has two or more roots. Wolffia arrhiza var. Australiana (water-meal) has no roots. Eradication is almost impossible. Water hyacinth, Eichhornia crassipes, is hard to eradicate because the seeds are long-lived. Three members of the submerged groups are Elodea canadensis (Canadian pondweed), Lagarosiphon major (oxygen weed), and Egeria densa (egeria). Elodea leaves occur in threes, egeria in fours and fives, and those of Lagarosiphon are alternate. (Buchanan-Davidson--Wisconsin)
W75-11220

THE ROLE OF ENDOGENOUS ABSCISIC ACID IN THE RESPONSE OF PLANTS TO STRESS,
Royal Univ. of Malta, Valletta. Dept. of Chemistry.
For primary bibliographic entry see Field 3F.
W75-11319

2J. Erosion and Sedimentation

MEASUREMENT OF COBBLE ABRASION IN NATURAL STREAMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
F. R. Carlson.
Arizona University, Tucson, Department of Hydrology and Water Resources, MS Thesis, 1974. 64 p, 12 fig, 6 tab, 25 ref, append.

Descriptors: *Abrasion, *Bed load, *Stream erosion, *Sediments, *Arizona, Weathering, Bedrock, Friction, Model studies, Streamflow, Particle size, Mathematical models, Measurement.
Identifiers: *Cobble abrasion.

Particle size of sediment in natural streams is modified by sorting, mixing, solution, and abrasion. Dynamic bed-load friction was not calculable, but varies directly with the size and concentration of moving bed loads. Wear was related to total work by abradibility, roundness, and rock strength. Abrasion efficiency of traceable cobbles in ephemeral streams in southern Arizona varied approximately with discharge squared. Field wear measurements compared well with prior laboratory model measurement. Changes in roundness while being transported over bedrock and en route weathering greatly affected the abrasion efficiency in natural streams. (McLachlan-Arizona)
W75-10881

FACTORS AFFECTING EROSION IN A SEMI-ARID WATERSHED,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
L. R. Davis.
Arizona University, Tucson, Department of Civil Engineering and Engineering Mechanics, MS Thesis, 1974. 89 p, 22 fig, 15 ref.

Descriptors: *Erosion, *Channel erosion, *Stream erosion, *Watersheds(Basins), *Semiarid climates, Erosion control, Sediment transport, Rainfall simulators, Erosion rates, *Arizona, Watershed management, Sediment yield, Sedimentation, Forecasting, Soil physical properties, Equations.
Identifiers: *Sycamore Creek(Arizona), Musgrave equation, Laursen equation.

Three separate erosion studies conducted in the Sycamore Creek watershed of Arizona concluded that a combination of rainfall simulator tests and an analysis of channel sediment-transport capacity provided the best estimate of the erosion potential of the watershed. The erosion rates were not a steady process. Previous studies treated erosion as a steady process and tended to grossly over-predict erosion. The first study was an application of the Musgrave erosion equation to the watershed. The equation predicted erosion with only a small degree of reliability. The second, or channel study was an application of the Laursen equation to the ephemeral stream that transports the erosion material from the watershed. This indicated that the channel could not transport the erosion material. The third, or rainfall simulator study established that the erosion material that could possibly be supplied to the Sycamore Creek channel was less than predicted in the initial study. (McLachlan-Arizona)
W75-10884

STABILIZATION AND RECONSTRUCTION OF TEXAS COASTAL FOREDUNES WITH VEGETATION,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 2L.
W75-10887

CONCURRENT NITRIFICATION-DENITRIFICATION AT THE SEDIMENT-WATER INTERFACE AS A MECHANISM FOR NITROGEN LOSSES FROM LAKES,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W75-10902

STOCHASTIC ANALYSIS OF PARTICLE MOVEMENT OVER A DUNE BED,
Geological Survey, Bay Saint Louis, Miss.
B. K. Lee, and H. E. Jobson.
Open-file report 75-358, March 1975. 205 p, 20 fig, 75 tab, 17 ref.

Descriptors: *Sediment transport, *Particle size, *Model studies, *Alluvial channels, *Stochastic processes, Streamflow, Analytical techniques, Equations, Dune sands, Sediments.
Identifiers: River dune bed.

Stochastic models are available that can be used to predict the transport and dispersion of bed-material sediment particles in an alluvial channel. These models are based on the proposition that the movement of a single bed-material sediment particle consists of a series of steps of random length separated by rest periods of random duration and, therefore, application of the models requires a knowledge of the probability distributions of the step lengths, the rest periods, the elevation of particle deposition, and the elevation of particle erosion. The procedure was tested by determining distributions from bed profiles formed in a large laboratory flume with a coarse sand as the bed material. The elevation of particle deposition and the elevation of particle erosion can be considered to be identically distributed, and their distribution can be described by either a 'truncated Gaussian' or a 'triangular' density function. The conditional probability distribution of the rest period given the elevation of particle deposition closely followed the two-parameter gamma distribution. The conditional probability distribution of the step length given the elevation of particle erosion and the elevation of particle deposition also closely followed the two-parameter gamma density function. For a given flow, the scale and shape parameters describing the gamma probability distributions can be expressed as functions of bed elevation. (Woodard-USGS)
W75-10942

BEACH EROSION CONTROL STRUCTURE,
For primary bibliographic entry see Field 8A.
W75-11075

THE WATER QUALITY AND BOTTOM SEDIMENT CHARACTERISTICS OF NEW JERSEY LAGOON DEVELOPMENTS,
Rutgers - the State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 5B.
W75-11104

MATAGORDA ISLAND, TEXAS: THE EVOLUTION OF A GULF COAST BARRIER COMPLEX,
Michigan Univ., Ann Arbor. Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 2L.
W75-11144

WEYL'S THEORY OF GLACIATION SUPPORTED BY ISOTOPIC STUDY OF NORWEGIAN CORE K 11,
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioactivities.
J. C. Duplessy, L. Chenouard, and F. Vila.
Science, Vol 188, No 4194, p 1208-1209, June 20, 1975. 1 fig, 16 ref.

Descriptors: *Isotope studies, *Glaciers, *Benthic fauna, *Glacial sediments, Temperature, Sea water, Core logging, Cores, Oxygen, Stable isotopes, Glaciology, Sedimentology, Oceanography, Deep water, Sinks.
Identifiers: *Norwegian Sea, *North Atlantic, Foraminifera.

Oxygen isotopic analyses of pelagic and benthic foraminifera from core K 11 indicate that during the last glaciation Norwegian Sea bottom waters were warmer than in modern times and had the same physical parameters (temperature, oxygen isotope ratio, and salinity) as the North Atlantic deep water. This result indicates that the glacial Norwegian Sea was not a sink for dense surface water, as it is now, and that during glacial times North Atlantic deep water invaded the deep Norwegian basin. (Sims-ISWS)
W75-11153

DENUDATION STUDIES: CAN WE ASSUME STREAM STEADY STATE,
Wisconsin Univ., Milwaukee. Dept. of Geography.
S. W. Trimble.
Science, Vol 188, No 4194, p 1207-1208, June 20, 1975. 1 fig, 9 ref.

Descriptors: *Erosion, *Sedimentation, *Streams, *Southeast US, Sediment yield, Erosion rates, Alluvium, Colluvium, Bed load, Suspended load, Suspended solids, Sediment transport, Agriculture, Reservoirs, Rivers.
Identifiers: Gross erosion, Eroded materials.

Contemporary stream sediment loads are dubious indicators of regional denudation. Recent analysis of 10 river basins in the southeastern United States indicates that of the material eroded from upland slopes since European settlement, only about 5% has been exported. The remainder, alluvium and colluvium, will probably not be exported because of extensive reservoir impoundments. (Sims-ISWS)
W75-11154

MASS-EMPLACED SAND-FINGERS AT MARAROA CONSTRUCTION SITE, SOUTHERN NEW ZEALAND,
Otago Univ., Dunedin (New Zealand). Dept. of Geology.
R. M. Carter.
Sedimentology, Vol 22, No 2, p 275-288, May 1975. 9 fig, 15 ref.

Descriptors: *Sediments, *Sedimentary structures, *Sediment transport, Mass transfer, Sands, Sand waves, Sedimentation, Sedimentology, Movement, Excavation, Dam construction, Deposition(Sediments), Geomorphology.
Identifiers: *New Zealand, Sand fans, Sand fingers.

During work on a dam construction site in South Island, New Zealand, outflowing groundwater resulted in extensive local mass transport of the sands being excavated. A series of small scale sand fans was built up, probably mainly by laminar mass-flow processes. The surfaces of the fans were made up of a series of complexly interdigitating sand fingers that are inferred to have been emplaced by viscous plug flow. Other sedimentary processes associated with the building and syn-sedimentary destruction of the fans included rapid grain flow, liquefaction, and progressive slumping. Although small in scale, the Mararoa mass-flow-fans may be a close analogue for some of the many 'fluxoturbidite' or 'proximal flysch' facies described in the sedimentological literature. Their geologic implications were therefore briefly discussed. (Sims-ISWS)
W75-11161

SIZE-SORTING DURING SUSPENSION TRANSPORTATION--LOGNORMALITY AND OTHER CHARACTERISTICS,
Indian Statistical Inst., Calcutta. Geological Studies Unit.
S. Sengupta.
Sedimentology, Vol 22, No 2, p 257-273, May 1975. 13 fig, 2 tab, 13 ref.

Descriptors: *Sediments, *Sieve analysis, *Sediment transport, *Particle size, Suspended solids, Sands, Sediment sorting, Sediment load, Bed load, Running waters, Laboratory tests, Flumes, Sedimentation, Sedimentology, Distribution patterns, Velocity, Turbulent flow.
Identifiers: Lognormality.

Grain size distributions of the suspended loads above a bed of bimodal size distribution (size range 2.00-0.04 mm) were studied in a laboratory flume at water velocities varying from 42 to 160 cm/s. With increase of velocity, the phi (logarithmic) size distribution of the suspended particles (at 5-20 cm above the bed) changed from a strongly skewed to a nearly symmetrical, unimodal form (nearly lognormal) through an intermediate bimodal stage. At low velocity, the skewness of the distribution changed from positive to negative with increase of height. The experiments indicate that lognormality of 'weight frequency' distribution of grain sizes is a transitional feature, attained through size sorting within a critical range of velocity and height above a sand bed of a given composition. The observed changes in the size distribution patterns were effected by a differential rate of increase in weight in the different size classes in suspension with increase of flow velocity. The phenomenon could be explained by the equation of relative suspension concentration which relates the relative concentration of a suspended particle of a particular diameter to the flow velocity of the turbulent fluid and the height of suspension above the bed. (Sims-ISWS)
W75-11162

INVESTIGATION OF THE OPERATING CHARACTERISTICS OF THE IOWA SEDIMENT CONCENTRATION MEASURING SYSTEM,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
F. A. Locher, J. R. Glover, and T. Nakato.
IIHR Report No 170, November 1974. 100 p, 40 fig, 6 tab, 15 ref. Army Contract DACW-72-73-C-0022.

Descriptors: *Instrumentation, *Sediment distribution, *Suspended solids, Laboratory tests, Calibrations, Sediment load, Entrainment, Laboratory equipment, Measurement, Turbulence.
Identifiers: *Sediment concentration, *Sediment sampler, Spectral analysis, Oscillatory flow, Instrument response.

Results of an investigation conducted to evaluate the capabilities and limitations of the Iowa Sediment Concentration Measuring System (ISCMS) were presented. The manner in which the ISCMS responded to a group of particles and to a single particle was presented. Specifically, problems with nonuniformities in the transducer field and problems created by inadequate frequency response were discussed. The results of tests conducted in an oscillatory flow facility were evaluated and the use of the ISCMS for measuring the instantaneous suspended sediment concentration was reviewed. Recommendations for improvement of the instrument were also suggested. (Adams-ISWS)
W75-11163

APPLICATION OF THE MANOMETRIC TECHNIQUE IN THE STUDY OF SEDIMENT OXYGEN DEPLETION,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-11222

SEDIMENT PROCESSES IN GREAT LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
P. G. Sly.
In: Ninth Canadian Hydrology Symposium, Fluvial Processes and Sedimentation, May 1973, Edmonton, Alberta, p 465-492. 1 fig, 97 ref.

Descriptors: *Sedimentology, *Great Lakes, *Lakes, *Sedimentation, Erosion, *Geology, Sediment transport, Sediment yield, Currents(Water), Shores, Beaches, Clays, Sands, Movement, Dunes, Silts, Bottom sediments, Sediment distribution, Lake shores, Waves(Water), River flow, Water circulation, Winds, Upwelling, Deltas.

In the Great Lakes, shoreline and nearshore sedimentation processes are influenced by bedrock and regional geology but processes controlling response to sub-aerial and sub-aqueous influences are poorly understood. Active beach zones are confined to narrow vertical ranges, sediment transport paths are restricted to basins, flocculation rates are slower, and silt size particulates are not well differentiated from sand and clay. Sediment transport by bedload and saltation processes are of limited importance, as reflected by scarcity of sedimentary features. These characteristics indicate that energy associated with water level fluctuations, seiches, and baroclinic circulations is less than in most tide driven systems of epicontinental and partly enclosed areas. Wind wave action is less intense and lacks the compounding effect of surface swell generated beyond local areas. Salinity is negligible. Physical processes dominate response of sedimentary environments but geochemical and biological processes are important, especially in transitional and deep mid-lake zones. Because lake studies involve 'low energy fields,' sensitive environmental indicators are needed. Lake systems are generally closed and sediment distributions reflect decreasing energy from nearshore to offshore which are sensitive to changes in effective energy. Variations are related to kinetic, baroclinic, basotrophic, upwelling, and thermal situations. (Buchanan-Davidson--Wisconsin)
W75-11237

PRELIMINARY INFORMATION ON THE NATURE OF ORGANIC MATTER IN THE SURFACE SEDIMENTS OF LAKES HURON, ERIE, AND ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
A. L. W. Kemp.
In: Proceedings Symposium on Hydrogeochemistry and Biogeochemistry, Vol 1, Earl Ingerson, editor. Clarke Company, Washington, D.C. 1973, p 40-48, 1 fig, 3 tab, 16 ref.

Descriptors: *Organic matter, *Great Lakes, *Humus, *Lake sediments, Organic compounds, Sedimentology, Bottom sediments, Humic acids, Fulvic acids, Organic acids, Separation techniques, Nitrogen, *Lake Huron, *Lake Erie, *Lake Ontario.
Identifiers: Bitumens, Humins, Kerogens.

Analysis of the top centimeter of sediment from Lakes Huron, Erie, and Ontario showed little difference in bitumen, humic acids, fulvic acids, and humine regardless of sediment type, depth, or location, indicating horizontal mixing of autochthonous organic matter before sedimenting. Results suggested a common organic precursor material for the lakes. Organic matter in surface sediment appeared to represent complex, relatively inert molecules, with most of the labile, simpler organic compounds eliminated in the water column. A 30-day alkali extraction removed 20% more fulvic and humic acids from the sediment. The organic matter contained bitumens (6-10%), humic and fulvic acids (21-36%), and humins (60-71%). The kerogen fraction was proporitional to lake trophic levels, indicating that bottom organisms are primarily responsible for early diagenesis of organic matter in sediments. The organic matter in Great Lakes sediment was similar to that of USSR tundra subsoils. Infrared and visible spectra of humic acids were similar to soil humic compounds. A major difference between sediment and soils was the high nitrogen values due to differences in precursor materials. The elemental analyses indicated that the Great Lakes humic acids are similar to those in small Japanese lakes and marine sediments. (Buchanan-Davidson--Wisconsin)
W75-11240

2K. Chemical Processes

SALT AND SPECIFIC ION EFFECTS ON GERMINATION OF FOUR GRASSES,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
J. Ryan, S. Miyamoto, and J. L. Stroehlein.
Journal of Range Management, Vol 28, No 1, p 61-64, January 1975. 1 tab, 2 fig, 12 ref.

Descriptors: *Range grasses, *Range management, *Salt tolerance, *Grazing, *Revegetation, Salts, Germination, Osmotic pressure, Erosion control, Irrigation, Drought tolerance, Ions, Chlorides, Sulfates.
Identifiers: Blue panicgrass, Lehmann lovegrass, Wilman lovegrass, Weeping lovegrass.

The effects of NaCl, CaCl2, MgCl2, Na2SO4, MgSO4, and CaSO4 on four range grasses, blue panicgrass, Lehmann lovegrass, Wilman lovegrass, and weeping lovegrass were investigated. Increased salt concentrations decreased germination, but the species and type of salt varied the extent of the decrease. Inhibition was greatest with Mg and least with Ca salts. At equal osmotic pressures the effect of specific ions also varied. Wilman and weeping lovegrasses were relatively salt tolerant. Germination of range grass species is influenced not only by salt concentrations, but also by the nature of the ions in the salt solution. Based on this information, plant species selections can be chosen that are best adapted to native soil conditions or where the salt composition has been altered by management or irrigation. (Mastic-Arizona)
W75-10894

NEAR-BOTTOM CHEMISTRY IN THE EASTERN PACIFIC AND NORTH ATLANTIC OCEANS,
Oregon State Univ., Corvallis. School of Oceanography.
C. H. Culberson, and R. M. Pytkowicz.
Limnology and Oceanography, Vol 20, No 3, p 463-467, May 1975. 1 tab, 30 ref. ONR Contract N00014-67-A-0369-0007.

Descriptors: *Water chemistry, *Atlantic Ocean, *Pacific Ocean, *Inorganic compounds, *Chemistry, Bodies of water, Stratification, Chemical analysis, Salinity, Oxygen, Dissolved oxygen, Hydrogen ion concentration, Alkalinity, Silicates, Phosphates, Nitrates, Chemical properties, Mineralogy, Sea water, Chlorides, Sampling, Sediments.
Identifiers: *Near-bottom chemistry, *Caribbean Sea.

Near-bottom chemistry at depths greater than 2000 m was studied in the eastern tropical Pacific (27 stations), the north-eastern Pacific (9 stations), the Caribbean Sea (1 station), and the North Atlantic (2 stations). Salinity oxygen, pH, alkalinity, silicate, phosphate, and nitrate were measured at eight heights from 0.6 to 300 m above the bottom. No measurable salinity, oxygen, alkalinity, silicate, phosphate, or nitrate gradients were observed. A statistically significant near-bottom increase in pH was found, but the increase was small and could have resulted from undetected analytical or sampling errors. (Henley-ISWS)
W75-10923

GEOCHEMICAL RECONAISSANCE OF SURFICIAL MATERIALS IN THE VICINITY OF SHAWANGUNK MOUNTAIN, NEW YORK,
For primary bibliographic entry see Field 5A.
W75-10928

THE MINOR AND TRACE ELEMENTS, GAS, AND ISOTOPE COMPOSITIONS OF THE PRINCIPAL HOT SPRINGS OF NEVADA AND OREGON,
Geological Survey, Menlo Park, Calif.
R. H. Mariner, T. S. Presser, J. B. Rapp, and L. M. Willey.
Open-file report, August 1975. 27 p, 2 fig, 9 tab, 11 ref.

Descriptors: *Chemical analysis, *Hot springs, *Basic data collections, *Nevada, *Oregon, Water quality, Thermal water, Geothermal studies, Water quality, Water chemistry, Inorganic compounds, Trace elements, Gases, Sampling, Analytical techniques.

Current interest in the geothermal potential of hot spring areas in Nevada and Oregon makes all data on hot springs in these areas valuable. Tabulated without interpretative comment are compositions of gases (oxygen plus argon, nitrogen, methane, and carbon dioxide), deuterium and oxygen (18) contents of the hot spring waters, trace and minor element chemical data for hot springs sampled in 1972 and 1973, and complete chemical analyses for several hot springs sampled in 1974. The detection limits for nickel and selenium were 0.05 mg/liter and 0.003 mg/liter, respectively. Detectable amounts of nickel were found in Oregon at Olene Gap Hot Spring (0.05 mg/liter) and in Nevada at West Pinto Hot Spring (0.05 mg/liter). Selenium in detectable amounts (0.003 mg/liter or more) was found in Oregon at Hunters Hot Springs (0.008), and in Nevada at the steam geyser at Needle Rocks (0.006), Bog Hot Springs (0.004), and the unnamed hot spring in Jersey Valley (0.003). (Woodard-USGS)
W75-10937

WATER RESOURCES OF THE LOWER ST. CROIX RIVER WATERSHED, EAST-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10945

WATER RESOURCES OF THE SNAKE RIVER WATERSHED, EAST-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10946

WATER RESOURCES OF THE LOWER MINNESOTA RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10947

WATER RESOURCES OF THE CANNON RIVER WATERSHED, SOUTHEASTERN MINNESOTA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10948

CONTINUOUS AUTOMATIC MONITORING OF SURFACE WATER WITH FISH.
Keuringsinstituut voor Waterleidingartikelen, Rijswijk (Netherlands).
For primary bibliographic entry see Field 5A.
W75-11079

URANIUM MINERALIZATION BY GROUND WATER IN SEDIMENTARY ROCKS, JAPAN.
Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan). Raw Materials Div.
For primary bibliographic entry see Field 2F.
W75-11145

A STUDY OF FACTORS CONTROLLING THE CHEMICAL QUALITY OF WATER IN CARTWRIGHT CREEK BASIN, WILLIAMSON COUNTY, TENNESSEE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Geology.
C. L. Sprinkle.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-244 830, $6.25 in paper copy, $2.25 in microfiche. Ms Thesis, Water Resources Research Center Report No 42, August 1973. 147 p, 20 fig, 10 tab, 23 ref, 4 append. OWRT B-018-TENN(2). 1431-0001-3650.

Descriptors: *Water chemistry, *Dissolved solids, *Streams, *Tennessee, Runoff, Groundwater, Water quality, Geology, Rocks, Soils, Chemistry, Chemical analysis, X-ray spectroscopy, Water analysis, Chemicals, Sampling, Leaching, Erosion, Chemical properties, Hydrology.
Identifiers: *Dissolution rates, *Cartwright Creek(Tenn).

This study was made to determine the factors controlling the geochemistry of ground and surface waters in a small carbonate drainage basin. In order to obtain a somewhat geographic sample of the 6 geologic formations and 14 soil types exposed in the basin, a total of 30 individual rock and soil samples were collected. Rates of dissolution for the major chemical constituents from the rock and soil samples were determined after 1, 2, 4, 8, 16, 32, 65, 130, 250 days. Assuming a 0.5 day mean-residence time for most of the water flowing from Cartwright Basin, a simple empirical model related the laboratory-measured dissolution rates of the rock and soil units with their porosities and areal extent in the basin to predict the concentrations of 5 ions common to the water flowing in Cartwright Creek. A water sample collected during high flow in Cartwright Creek on July 17, 1972 (approximately one-half day after a storm) had measured values for the 5 ions that matched the predicted concentrations. The model was less successful in predicting ion concentrations for the 12-month average Cartwright Creek chemical load. (Sims-ISWS)
W75-11164

CONCENTRATION AND GENERA OF ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1973,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W75-11165

SPECIFIC CONDUCTANCE METHOD FOR IN SITU ESTIMATION OF TOTAL DISSOLVED SOLIDS,
Northern Forest Research Center, Edmonton (Alberta).
For primary bibliographic entry see Field 5A.
W75-11167

CHELATION STUDY OF COPPER (II): FULVIC ACID SYSTEM,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W75-11219

EXTRACTION AND ANALYTICAL TECHNIQUES FOR PESTICIDES IN SOIL, SEDIMENT, AND WATER,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5A.
W75-11236

2L. Estuaries

STABILIZATION AND RECONSTRUCTION OF TEXAS COASTAL FOREDUNES WITH VEGETATION,
Texas Tech Univ., Lubbock.
B. E. Dahl, B. A. Fall, A. Lohse, and S. G. Appan.
Gulf Universities Research Consortium, Galveston, Texas, Report 139, August, 1974. 343 p, 55 fig, 41 tab, 20 append, 89 ref. DACW 72-72-C-0013.

Descriptors: *Coastal engineering, *Shore protection, *Vegetation effects, *Vegetation establishment, *Erosion control, Texas, Coasts, Beach erosion, Beaches, Soil erosion, Tidal effects, Waves(Water), Dunes, Sands, Wind erosion, Plant populations, Land management, Soil conservation, Soil stabilization, Cover crops, Planting management, Grasses.
Identifiers: *Padre Island, Beach grasses, Sea oats, Bitter panicum.

Experiments were conducted from 1969 to 1974 on Padre Island, Texas, to to establish technical specifications and methodologies for the use of beach grasses to construct and stabilize foredunes along the Gulf Coast as storm surge barriers. Bitter panicum and sea oats were the best adapted species for beach plantings, with winter through spring being the most favorable transplanting period. Foredunes were established across overwash channels by creating an elevated, flat, relatively salt-free surface using parallel rows of two-foot-high sand fencing, and then transplanting both grasses. (Robinett-Arizona)
W75-10887

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOL. II, ASPECTS OF COMPUTATION,
RAND Corp., Santa Monica, Calif.
J. J. Leendertse, and S-K. Liu.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 501, $5.75 in paper copy, $2.25 in microfiche. Completion Report R-1764-OWRT, June 1975. 123 p, 62 fig, 26 ref, 4 append. OWRT C-5252(No 4237)(1).

Descriptors: *Estuaries, *Mathematical models, *Numerical methods, Tides, Fluid dynamics, Computer models, Coastal engineering, *Finite differences, *Simulation analysis, Unsteady flow, *Model studies, Bays, Coasts.
Identifiers: *Three-dimensional flow model.

Different computational aspects of the use of a three-dimensional finite-difference model of estuaries, bays, and coastal seas are described. With this model, salinity and temperature distributions can be computed, together with the flow field, and then coupled to the flow computation by a complicated equation of state. In the model an approximation for the sub-gridscale effects is introduced by use of mass and momentum exchange coefficients. The vertical exchanges are dependent on the Richardson number. The model is tested in bays and estuaries with widely different characteristics (Grevelingen, Chesapeake Bay, San Francisco Bay, and the Strait of Juan de Fuca). The results are presented in graphic form. Effective simulations can be made with the model. (See also W74-04301)
W75-10900

AUTOMATED TIDAL COMPUTATIONS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10912

NEAR-BOTTOM CHEMISTRY IN THE EASTERN PACIFIC AND NORTH ATLANTIC OCEANS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2K.
W75-10923

STOCHASTIC ANALYSIS OF PARTICLE MOVEMENT OVER A DUNE BED,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 2J.
W75-10942

A NOTE ON SALINITY AND TEMPERATURE IN SOME MOROCCAN BRACKISH WATERS,
Ghent Rijksuniversiteit (Belgium). Dept. of Zoology.
C. Heip, E. De Coninck, P. Engels, G. Engler, and G. Verschueren.
Bull Soc Sci Nat Phys Maroc. Vol 52, No 3/4, p 25-29, 1972.

Descriptors: *Salinity, *Brackish water, *Water temperature, Sediments, Air temperature, Atlantic Ocean, Coasts.
Identifiers: *Morocco, Polyhaline waters, Hyperhaline salt mines.

A series of measures of temperature and salinity was made in brackish waters along the Atlantic coast of Morocco. All waters examined were polyhaline, except for a series of hyperhaline salt mines. The importance of temperature in the sediment is discussed: temperature in the top layer may rise considerably (7C) above air temperature. In the deeper layers the temperature is lowere than in the air and the water.--Copyright 1974, Biological Abstracts, Inc.
W75-10997

THE INFLUENCE OF THE WARM COOLING WATER FROM A FOSSIL FUELED POWER PLANT ON OCEANOGRAPHIC CONDITIONS AND COMPOSITION OF PLANKTON IN OWASE BAY I. WATER TEMPERATURE IN RELATION TO DISTRIBUTION OF MICROPLANKTON, (IN JAPANESE),
Shimonoseki Univ. of Fisheries (Japan).
For primary bibliographic entry see Field 5C.
W75-11030

IMPACT OF THERMAL EFFLUENT FROM STEAM-ELECTRIC STATION ON A MARSHLAND NURSERY AREA DURING THE HOT SEASON,
Florida Univ. at Marineland, St. Augustine. C.V. Whitney Marine Lab.
For primary bibliographic entry see Field 5C.
W75-11032

MANAGEMENT OF RETARDATION OF SALT WATER INTRUSION IN COASTAL AQUIFERS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W75-11058

MATAGORDA ISLAND, TEXAS: THE EVOLUTION OF A GULF COAST BARRIER COMPLEX,
Michigan Univ., Ann Arbor. Dept. of Geology and Mineralogy.
B. H. Wilkinson.
Geological Society of America Bulletin, Vol 86, No 7, p 959-967, July 1975. 11 fig, 10 ref.

Descriptors: *Barrier Islands, *Evolution, *Erosion, *Sedimentation, *Gulf of Mexico, *Texas, Estuaries, Gulf coastal plain, Oceans, Sands, Sand bars, Island, Coasts, Bayous, Rivers, Stabilization, Recent epoch, Pleistocene epoch, Geomorphology.

Identifiers: *Matagorda Island(Tex).

Matagorda Island is a wide, sand-rich, barrier-island complex on the central Texas coast. This barrier initially formed as an intermittently emergent sand shoal which migrated landward during the late Holocene transgression and then became stabilized as the Gulf of Mexico reached stillstand. The subaerial portion of the island complex rests on a blanket of middle Holocene Bay-estuarine mud which was desposited behind the landward-migrating sand body and then was overridden by it. Following stillstand, Matagorda Island prograded Gulfward approximately 1.6 km. During this progradation, two large tidal passes, which connected the Gulf of Mexico with San Antonio and Mesquite Bays, were closed. The island was further modified by migration of Cedar Bayou several miles to the west across the island's southern end. Two sources of sand contributed to this barrier complex. Prior to stillstand, erosion of Pleistocene strandplain sand and middle Holocene fluvial-deltaic sand exposed on the shelf supplied most of the sediment to the early barrier. Following stillstand, with progradation, shelf sands were too deeply submerged to be eroded by Gulf waves. Sand discharged into the Gulf by the Colorado and Brazos Rivers and transported southwestward by longshore currents was desposited on the beach and shoreface of Matagorda Island. (Sims-ISWS)
W75-11144

NOTE ON THE MEASUREMENT OF THE RESPONSE OF OCEANOGRAPHIC TEMPERATURE SENSORS,
National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
For primary bibliographic entry see Field 7B.
W75-11146

EFFECTS OF ENTRANCE LOSS ON HARBOR OSCILLATIONS,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
For primary bibliographic entry see Field 8B.
W75-11147

WEYL'S THEORY OF GLACIATION SUPPORTED BY ISOTOPIC STUDY OF NORWEGIAN CORE K 11,
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioactivities.
For primary bibliographic entry see Field 2J.
W75-11153

BEHAVIOR OF MN, FE, CU, ZN, CD AND PB DISCHARGED FROM A WASTEWATER TREATMENT PLANT INTO AN ESTUARINE ENVIRONMENT,
Maryland Univ., College Park. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W75-11160

STRATEGIC APPROACH TO ESTUARINE ENVIRONMENTAL MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
D. A. Bella.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of ASCE, Vol 101, No WW1, Paper No 11109, February 1975. p 73-92. 2 fig, 13 ref.

Descriptors: *Estuaries, *Management, *Environmental effects, *Harbors, *Oregon, *Comprehensive planning, Ecology, Water management(Applied), Environmental engineering.

Ecological systems must be examined from a spectrum of views ranging from those of high perspective-low detail to those of low perspective-high detail. Such a spectrum should provide complementary views of real world systems, the 'true' nature of which is beyond our capacity to perceive. A high perspective low detail view is employed herein to examine the organization, function, and requirements of whole estuarine systems. Concerns pertinent to comprehensive environmental planning of estuaries are identified. A planning approach that calls for the uneven distribution of development activities among Oregon's estuarine systems is presented. This approach places a high value on environmental variety, including a wide range of undeveloped ecosystems. Cluster communities with intervening open space are called for within systems selected for development. A number of methods, concerns, and problems related to the implementation of this approach are identified. Although the method is recommended for Oregon's estuaries, emphasis is given to general concepts that have wider applicability. (Bell-Cornell)
W75-11179

AMMONIA EXCRETION BY ZOOPLANKTON AND ITS SIGNIFICANCE TO PRIMARY PRODUCTIVITY DURING SUMMER,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W75-11187

A SURVEY OF FISHES AND COMMERCIAL INVERTEBRATES OF THE NEARSHORE AND ESTUARINE ZONE BETWEEN CAPE ROMANO AND CAPE SABLE, FLORIDA,
National Marine Fisheries Service, Panama City, Fla. Gulf Coastal Fisheries Center.
For primary bibliographic entry see Field 2I.
W75-11189

THE ROLE OF PLANKTONIC PROTOZOA IN THE MARINE FOOD CHAIN. SEASONAL CHANGES, RELATIVE ABUNDANCE, AND CELL SIZE DISTRIBUTION OF TINTINNIDA,
New York Aquarium, Brooklyn. Osborn Labs. of Marine Sciences.
For primary bibliographic entry see Field 5C.
W75-11191

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PHYSIOCHEMICAL TREATMENT OF WASTE-WATER-SEAWATER MIXTURE BY ELECTROLYSIS,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W75-10979

MEMBRANE DESALTING GETS BIG PUSH,
Office of Water Research and Technology, Washington, D.C.
M. E. Mattson.
Water and Wastes Engineering, Vol 12, No 4, p 35, 36, 38, 40, 42, April, 1975. 7 fig.

Descriptors: *Waste water treatment, *Municipal water, *Membrane processes, Electrodialysis, Reverse osmosis, Capital costs, Operating costs, Design, Economics, Desalination processes, *Treatment facilities, California, Colorado River.
Identifiers: Brackish water desalting.

Two large brackish water membrane desalting plants are near completion. One, in Santa Ana, California, has planned a multi-phase program for its 75 mgd facility to test reverse osmosis (RO), electrodialysis (ED), and ion exchange. On the lower Colorado River, an even larger desalting plant, of 100 mgd, is planned, with a test facility at Yuma, Arizona to evaluate pre-treatment and to compare reverse osmosis, and electrodialysis and the use of a combination of these two processes. Design characteristics, advantages, problems, and costs of RO and ED are detailed. While both methods have only recently been applied to large municipal water systems (ED in 1962, RO in 1971), treatment plant personnel have been satisfied with each. Economic comparisons of the two membrane processes indicate that: the two desalting applications are competitive with each other; with low salinity brackish waters (under 5000 ppm TDS), ED has a slight advantage over RO; capital costs and operating costs for ED systems decreases more rapidly with increasing plant size; and, RO is not as sensitive to variations in feed salinity as ED. Actual operating and capital costs at several large municipal plants show that local conditions such as plant load factors or fouling problems cause much variation. Both reverse osmosis and electrodialysis are recommended for future usage. (Prague-FIRL)
W75-10982

CALCIUM SULFATE SOLUBILITY IN BRACKISH WATER CONCENTRATES AND APPLICATIONS TO REVERSE OSMOSIS PROCESSES: POLYPHOSPHATE ADDITIVES,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5D.
W75-11004

ELECTROLYTIC SEA WATER PROCESS,
Diamond Shamrock Corp., Cleveland, Ohio. (assignee)
R. E. Loftfield, J. E. Bennett, and J. E. Cinke.
U.S. Patent No 3,893,902, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 653-654, July 8, 1975.

Descriptors: *Patents, *Sea water, *Desalination, Waste water treatment, *Water purification, *Electrolysis, Electrodes, Anodes, Cathodes.
Identifiers: Hypochlorite.

A method is provided for the electrolysis of sea water which reduces the formation of undesirable deposits on the electrodes of the cell and produces hypochlorite. The cell is comprised of an enclosure containing vertically placed electrodes in an alternating array of anodes and cathodes. Sea water is introduced to the cell at a point below the electrodes through a series of orifices corresponding in number and location to the cathodes. The direction of the orifices is such that the sea water first impinges primarily on nonelectrode surfaces immediately subjacent the electrodes at a velocity of between 5 and 25 feet per second. The sea water velocity through the cell is maintained sufficient to at least suspend substantially all particulate matter present. Electrolysis is intermittently halted and the cell is flushed with sea water introduced through orifices at a point above, and directed onto the electrodes. This removes a slurry of particulate material from the bottom of the cell and electrolysis can be resumed. (Sinha-OEIS)
W75-11068

SYSTEM FOR OPTIMAL PRESSURE CONTROL IN A MULTI-STAGE EVAPORATION UNIT,
Deutsche Texco A.G., Hamburg. (West Germany). (assignee)
A. Hoppe, and W. Geistert.
U.S. Patent No 3,894,915, 4 p, 3 fig, 11 ref; Official Gazette of the United State Patent Office, Vol 936, No 3, p 998, July 15, 1975.

Descriptors: *Patents, *Water quality, *Water pollution treatment, *Evaporation, Condensation, Distillation, Equipment, Evaporators, *Heat exchangers, Desalination.

A system for optimal pressure control in a multi-stage evaporation unit is comprised of two or more series connected evaporation stages with at least one of the stages preceded by a heat source. The fresh or feed solution is passed through heat exchangers where it is heated by means of the vapors from the subsequent evaporation stages. The heat exchanger is adapted to permit free flow of the vapor condensate through the heat exchanger inner portion. The heat exchanger installed in the line through which the vapor effluent leaves the higher-pressure evaporation unit acts as a throttling means to permit unimpeded passage of the vapor condensate and assumes the pressure expanding function formerly performed by the pressure control valve. (Sinha-OEIS)
W75-11070

3B. Water Yield Improvement

DIFFERENTIAL RELEASE OF WATER FROM ARIZONA SNOWPACKS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2C.
W75-10860

HYDROGEOLOGY AND WATER RESOURCES OF MIDDLE KIRKLAND CREEK BASIN, YAVAPAI COUNTY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W75-10872

EFFECTS OF PINYON-JUNIPER REMOVAL ON NATURAL RESOURCE PRODUCTS AND USES IN ARIZONA,
Forest Service (USDA), Phoenix, Ariz. Rocky Mountain Forest and Range Experiment Station.
W. P. Clary, M. B. Baker, P. F. O'Connell, T. N. Johnsen, Jr., and R. E. Campbell.
Research Paper RM-128, October, 1974. 28 p, 12 fig, 9 tab, 78 ref.

Descriptors: *Water yield improvement, *Vegetation effects, *Pinyon pine trees, *Juniper trees, Herbicides, Forages, Small watersheds, Sediment yield, Water quality, Wildlife, Recreation, *Arizona, Multiple-purpose projects.

Results of water yield improvement tests are evaluated with regard to their impacts on multiple uses of the land. Included in this examination are water quality and quantity, overstory vegetation, understory vegetation, potential livestock carrying capacity, wildlife values, and recreation and aesthetics. Pinyon-juniper removal was done by cabling, herbicide, and felling in an attempt to improve water yields. Of the three treatments only the herbicide treatment with picloram appears to provide an increase in water yield, but the negative aesthetic effect of dead standing trees was undesirable. Overstory vegetation removal will result in a severalfold increase in herbage production for livestock and wildlife. There was no meaningful increase in sediment yield as a result of overstory removal. A combination of herbicide treatment and fire appears the most promising method for future juniper control research from the standpoint of water production, forage production, deer response, and economics. (Mastic-Arizona)
W75-10886

REVEGETATING DISTURBED AREAS IN THE SEMIARID SOUTHWEST,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W75-10892

APPROXIMATE ANNUAL WATER BUDGETS OF TWO CHAINED PINYON-JUNIPER SITES,
Utah State Univ., Logan. Watershed Science Unit.
For primary bibliographic entry see Field 4A.
W75-10896

WIND EFFECTS ON CHEMICAL FILMS FOR EVAPORATION SUPPRESSION AT LAKE HEFNER,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
F. R. Crow, and A. L. Mitchell, Jr.
Water Resources Research, Vol 11, No 3, p 493-495, June 1975. 4 fig, 8 ref. Bureau of Reclamation Contract 14-06-5629.

Descriptors: *Evaporation control, *Winds, *Films, *Lakes, *Oklahoma, Evaporation, Hexadecanol, Octadecanol, Slurries, Application equipment, Application methods, Retardants, Thin films, Research and development, Alcohols, Rates of application, Wind velocity.
Identifiers: *Lake Hefner(OK), Wind direction.

An evaporation suppression research project was conducted at Lake Hefner, Oklahoma, where water-based slurries of hexadecanol and octadecanol were applied at the upwind side of the lake by an offshore sprinkler system. The distribution system was designed for maximum film cover under south winds. The chemical was applied at a variable rate adjusted to the demand created by local wind speed and direction. The application rate required to replace film removed by the wind, in terms of pounds per hour per foot of distribution line perpendicular to the wind, averaged 6.5-8 times greater than for an experimental pond with a similar application system. The upper wind speed limit for successful film application was 13 miles per hour (mph). Distribution studies were made to determine the percent of time that wind speeds and directions were favorable to the application of film, i.e., with speeds less than 13 mph and direction between 135 degrees and 225 degrees azimuth. Under wind conditions experienced in Oklahoma it was difficult to maintain continuous film cover because of the frequency of occurrence of high wind speeds and shifts in wind direction. (Roberts-ISWS)
W75-10920

AN APPRAISAL OF POTENTIAL WATER SALVAGE IN THE LAKE MCMILLEN DELTA AREA, EDDY COUNTY, NEW MEXICO,
Geological Survey, Reston, Va.
E. R. Cox, and J. S. Havens.
Available from Supt. of Documents, GPO, Washington, D.C. 20402, $1.50 in paper copy. Water-Supply Paper 2029-E, 1974. 26 p, 4 fig, 2 plate, 8 tab, 11 ref.

Descriptors: *Water conservation, *New Mexico, *Evapotranspiration control, *Phreatophytes, *Tamarisk, Reservoirs, Evapotranspiration, Water yield improvement, Water reuse.
Identifiers: *Lake McMillan(N Mex).

The amount of water used by saltcedar in the area of the old delta of Lake McMillan, New Mexico, and the amount of water that might be salvaged by eradication of saltcedar by construction of floodways through the delta area are estimated. Saltcedar growth increased from about 13,700 acres in 1952 to about 17,000 acres in 1960, a 25% increase. Most of this increase was in the areal density range near zero to 30%. The estimated average transpiration of phreatophytes in the Artesia to Lake McMillan reach is 29,000 acre-feet of water per year. In the reach from Artesia to the Rio Penasco, where the regional water table is above the Pecos River, saltcedar eradication might salvage from 10,000 to 20,000 acre-feet of water per year for use downstream. From the Rio Penasco to Lake McMillan, the river is perched above the water table; therefore, elimination of the saltcedar would probably not increase flow in the river, nor would drains be effective. Clearing in this reach, however, might increase the flow at Major Johnson Springs below Lake McMillan. Floodways through this reach would eliminate some evapotranspiration but might increase the sediment deposited by floodwaters in Lake McMillan. (Woodard-USGS)
W75-10941

DEVELOPMENT OF A BIBLIOGRAPHIC INFORMATION SYSTEM FOR WATER YIELD IMPROVEMENT PRACTICES,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 10B.
W75-11050

AN ELEVATIONAL CONTROL OF PEAK SNOWPACK VARIABILITY,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Colorado Univ., Boulder. Dept. of Geography.
For primary bibliographic entry see Field 2C.
W75-11155

WIND-SNOW RELATIONS AT MARMOT CREEK, ALBERTA,
Atmospheric Environment Service, Calgary (Alberta).
For primary bibliographic entry see Field 2C.
W75-11226

HYDROLOGIC RELATIONS ON UNDISTURBED AND CONVERTED BIG SAGEBRUSH LANDS: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W75-11313

3C. Use Of Water Of Impaired Quality

USE OF AMENDMENTS TO REDUCE WATER REQUIREMENTS FOR STAND ESTABLISHMENT OF SMALL-SEEDED CROPS,
Arizona Univ., Tucson. Dept. of Plant Sciences.
For primary bibliographic entry see Field 3F.
W75-11045

CHANGES IN VEGETATION AND SURFACE SOIL PROPERTIES FOLLOWING IRRIGATION OF WOODLANDS WITH MUNICIPAL WASTEWATER,
Michigan State Univ., East Lansing. Dept. of Forestry.
For primary bibliographic entry see Field 5B.
W75-11243

STATUS OF WASTE HEAT UTILIZATION AND DUAL-PURPOSE PLANT PROJECTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 3E.
W75-11251

3D. Conservation In Domestic and Municipal Use

SOCIAL IMPACTS OF WATER RESOURCES DEVELOPMENTS AND THEIR IMPLICATION FOR URBAN AND RURAL DEVELOPMENT: A POST AUDIT ANALYSIS OF THE WEBER BASIN PROJECT IN UTAH,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
For primary bibliographic entry see Field 6B.
W75-10854

FLOOD RUNOFF FROM URBAN AREAS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-10904

A CASE STUDY OF SOME ECONOMIC ASPECTS OF THE NATIONAL FLOOD INSURANCE PROGRAM,
Mississippi State Univ., Mississippi State. Div. of Business Research.
For primary bibliographic entry see Field 6F.
W75-10906

INDUSTRY AND COMMUNITY IN COOPERATION,
K-Konsult, Lund (Sweden).
For primary bibliographic entry see Field 5D.
W75-10985

WATER APPLICATION PRACTICES AND LANDSCAPE ATTRIBUTES ASSOCIATED WITH RESIDENTIAL WATER CONSUMPTION,
New Mexico State Univ., University Park. Dept. of Horticulture.
D. J. Cotter, and D. B. Croft.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 724, $4.75 in paper copy, $2.25 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No 049, Completion Report, November 1974, 112 p, 18 tab, 57 ref, append. OWRT C-4060(No 9012)(1).

Descriptors: *Landscaping, *Aesthetics, *Water conservation, Municipal water, Water consumption, Arid climates, Southwest US, Bermuda grass, Fescues, Analytical techniques, New Mexico, Surveys, Water demand, Social values, Water utilization, Measurement.
Identifiers: *Urban landscapes, New Mexico alta rescue, Hybrid Bermuda turf, Factor analysis, *Peak water demand.

The peak water load demand on municipal systems is often caused by water used to maintain urban landscapes. Research was conducted to determine methods for reducing water used on urban landscapes and to enhance the esthetic role of plants in the urban landscape. Two broad approaches were employed: evaluation of water application on urban landscapes in relation to size and type of landscape; and description of esthetic dimensions of urban landscapes in relation to water consumed. Residents applied more water than needed to maintain the landscape, and the specific amounts depended upon the season and landscape type. An instrument, the Residential Landscape Description Questionnaire (RLDQ), was developed for rating the esthetic qualities of a residential landscape. The evidence indicated the RLDZ was highly reliable and valid. The most feasible method of reducing municipal peak water usage is to minimize excesses and utilize landscape design criteria which conserve water and are esthetically attractive. In view of the fact that residents tend to apply up to 50% more water than needed to maintain the esthetic and health qualities of the landscape, it is recommended that an educational program be initiated to improve the water application practices as well as the design of landscapes as one technique for reducing the amount of water used to maintain residential landscapes. (Hain-New Mexico State)
W75-11059

LAND AND WATER RESOURCES SURVEY IN THE JEBEL MARRA AREA, THE SUDAN.
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 4A.
W75-11139

HYDROLOGIC INVESTIGATION AND DESIGN OF URBAN STORMWATER DRAINAGE SYSTEMS,
Snowy Mountains Engineering Corp., Canberra (Australia).
For primary bibliographic entry see Field 4A.
W75-11141

THE DESIGN OF STORM WATER DRAINAGE CHANNELS USING MATHEMATICAL MODEL TECHNIQUES,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 8B.
W75-11150

AN IMPLICIT APPROACH TO PRICING AGRICULTURAL WATER TRANSFERS TO URBAN USES,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W75-11178

VACUUM DISTILLATION/VAPOR FILTRATION WATER RECOVERY,
General American Transportation Corp., Niles, Ill.
For primary bibliographic entry see Field 5D.
W75-11315

3E. Conservation In Industry

IMPACT OF ENERGY DEVELOPMENT ON THE LAW OF THE COLORADO RIVER,
California Univ., Los Angeles. School of Law.
For primary bibliographic entry see Field 4C.
W75-10869

INDUSTRY AND COMMUNITY IN COOPERATION,
K-Konsult, Lund (Sweden).
For primary bibliographic entry see Field 5D.
W75-10985

LEGAL AND INSTITUTIONAL PROBLEMS IN THE MANAGEMENT OF SALINITY,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 5G.
W75-11047

IMPROVED DESIGN AND OPERATING CRITERIA FOR RURAL WATER DISTRICTS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6D.
W75-11056

DESIGN CONSIDERATIONS--WATER AND EFFLUENT DISPOSAL,
For primary bibliographic entry see Field 5D.
W75-11128

STATUS OF WASTE HEAT UTILIZATION AND DUAL-PURPOSE PLANT PROJECTS,
Oak Ridge National Lab., Tenn.
S. E. Beall, and M. M. Yarosh.
Available from the National Technical Information Service, Springfield, Va 22161 as CONF-731101-56, $4.00 in paper copy, $2.25 in microfiche. Presented at the American Nuclear Society meeting, San Francisco, California, November 11-16, 1973. 44 p, 18 fig, 5 tab, 26 ref. AEC 731101-56.

Descriptors: *Heat transfer, *Heated water, *Heating, *Aquiculture, *Return flow, Energy transfer, Powerplants, Tennessee Valley Authority, Commercial shellfish, Catfishes, Steam, Thermal power, Agriculture, Greenhouses, Europe, Heat exchangers, Fish farming, Asia.
Identifiers: *Waste heat, *Dual purpose energy plants, Mariculture, Ploesti(Romania), Japan.

One method for conserving energy is to use heat which has been discharged from some conversion mechanism or industrial process. Although there are incentives to use discarded heat, there are also disincentives: the necessity of locating the user near the heat source, the potential interruptable nature of the service, the possibility of chemical or radioactive contamination, and seasonal variation in source temperature. The status of several pioneering projects in the substitution of once-used heat for heat from fossil fuels is reported. Demonstrations of the economic feasibility of closed-environment agriculture warmed by waste heat, proposed by the Oak Ridge National Laboratory-TVA and by the Northern States Power Company as well as projects already completed by the University of Arizona, are described. The utilization of warm discharge water for irrigation and frost protection for outdoor agriculture and for aquaculture and mariculture is discussed. Salt water shrimp, catfish, oysters, clams and abalone have been successfully raised experimentally in warm waste water enhanced environments. The status of several dual-purpose (electrical power and industrial steam) energy plant projects is assessed. Although significant savings in fuel and improvements in overall efficiency are possible from dual-purpose plants, only limited application of the concept has been made. (Becker-Wisconsin)
W75-11251

THE WATER INDUSTRY IN TRANSITION,
National Water Council, London (England).
P. E. Stott.
Conference of British Industry Review, No 13, p 22-31, 1974. 1 fig.

Descriptors: *Water management(Applied), *Water policy, *Administrative agencies, Water supply, Water quality control, Regions, Europe, Sewerage, Financing, Income, Regional analysis, Water districts.
Identifiers: *England, *Wales, *Regional administration.

The implementation of the 1973 Water Act in England and Wales called for a radical restructuring of the administration of water and sewerage functions. Nine regional water authorities in England and the Welsh National Water Development Authority were set up based on river basins, the role of the twelve-member National Water Council was defined, the Water Research Centre was established, and the Water Space Amenity Commission was created. The ten multi-functional regional authorities are responsible for water resources and supply; sewerage and sewage disposal; the prevention of pollution; land drainage and flood protection; fisheries; the recreational and amenity use of their water space; and in some cases, for navigation. The new jurisdictional units need updated information on costs, standards and the state of repair as well as research and development support. Local authorities remain as agents for the development and maintenance of local sewerage systems, and statutory water companies remain as agents for the supply of water within their areas. The coordination of workers from many local authorities remains an important objective. New financing strategies, although authorized, have not been used due to administrative obstacles. A summary of detailed objectives of the massive reorganization is included. (Becker-Wisconsin)
W75-11252

NON-RENEWABLE, NON-ENERGY RESOURCES,
Leicester Univ (England). Public Sector Economics Research Centre.
For primary bibliographic entry see Field 6B.
W75-11253

HOW STEAM IS PRODUCED AND HANDLED AT THE GEYERS,
For primary bibliographic entry see Field 4B.
W75-11280

SUBSURFACE WATER -- TOOL FOR PETROLEUM EXPLORATION,
Mobil Research and Development Corp., Dallas, Tex.
For primary bibliographic entry see Field 4B.
W75-11289

WASTE WATER SURVEY, ST. REGIS PAPER COMPANY, CANTONMENT, FLORIDA.
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5D.
W75-11314

UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS MODIFICATIONS AND PRETREATMENT,
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 5D.
W75-11320

UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 2). WASTE TREATMENT,
Bell, Galyardt and Wells, Omaha, Nebr.
For primary bibliographic entry see Field 5D.
W75-11321

UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 3). CHOOSING THE OPTIMUM FINANCIAL STRATEGY,
Commins (J. A.) and Associates, Inc., Fort Washington, Pa.
For primary bibliographic entry see Field 5D.
W75-11322

POLLUTION ABATEMENT IN A BREWING FACILITY.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 5D.
W75-11323

UPGRADING METAL-FINISHING FACILITIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS POLLUTION ABATEMENT,
Oxy Metal Finishing Corp., Madison Heights, Mich.
For primary bibliographic entry see Field 5D.
W75-11324

UPGRADING METAL-FINISHING FACILITIES TO REDUCE POLLUTION. (PART 2). WASTE TREATMENT,
Lancy Labs., Inc., Zelienople, Pa.
For primary bibliographic entry see Field 5D.
W75-11325

UPGRADING TEXTILE OPERATIONS TO REDUCE POLLUTION. (PART 1). IN-PLANT CONTROL OF POLLUTION.
Institute of Textile Technology, Charlottesville, Virginia.
For primary bibliographic entry see Field 5D.
W75-11326

UPGRADING TEXTILE OPERATIONS TO REDUCE POLLUTION. (PART 2). WASTE-WATER TREATMENT SYSTEMS.
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W75-11327

UPGRADING POULTRY-PROCESSING FACILITIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS POLLUTION ABATEMENT,
Environmental Engineering, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 5D.
W75-11328

UPGRADING POULTRY-PROCESSING FACILITIES TO REDUCE POLLUTION. (PART 2). PRETREATMENT OF POULTRY-PROCESSING WASTES,
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 5D.
W75-11329

UPGRADING POULTRY-PROCESSING FACILITIES TO REDUCE POLLUTION. (PART 3). WASTE TREATMENT.
Giffels Associates, Inc., Detroit, Mich.
For primary bibliographic entry see Field 5D.
W75-11330

MEASURES IN THE SULFITE PULP INDUSTRY FOR DECREASING WASTE WATER LOAD (MASSNAHMEN DER SULFITZELLSTOFF-INDUSTRIE ZUR MINDERUNG DER ABWASSER-BELASTUNG),
Chemiefaser Lenzing A.G. (Austria).
For primary bibliographic entry see Field 5D.
W75-11339

POSSIBILITIES OF REUTILIZATION OF KAOLIN FROM BIOLOGICAL WASTE WATER SLUDGES (MOEGLICHKEITEN DER WIEDERVERWERTUNG VON KAOLIN AUS BIOLOGISCHEN ABWASSERCHLAEMMEN),
Papierfabrik Biberist (Switzerland).
For primary bibliographic entry see Field 5D.
W75-11349

3F. Conservation In Agriculture

EFFECTS OF IRRIGATION IN RAIN-FED FIELDS ON THE GROWTH AND YIELD OF UPLAND RICE VARIETIES, (IN KOREAN),
Kyungpook National Univ., Taegu (Republic of Korea). Coll. of Agriculture.
S. Y. Jeh.
Res Rep Off Rural Dev (Crop) (Suwon), 16 p 127-132, 1974. Illus.

Descriptors: *Rice, *Irrigation, *Crop production, Growth rate.

Differences of the characters and yield of 14 upland and 2 lowland rice varieties cultivated under irrigated, partially-irrigated and dry field conditions were studied. Under dry conditions, heading and maturity were greatly delayed and ratios of valid tillers, fertilized spiklets and ripening and yield in both rough and brown rice were relatively lower, while numbers of tillers and spikelets and straw weight were greater under the other 2 conditions. There was not substantial difference in growth and yield of rice between the irrigated and partially-irrigated conditions.--Copyright 1975, Biological Abstracts, Inc.
W75-10853

EFFECTS OF ANTITRANSPIRANTS ON YIELD OF GRAIN SORGHUM UNDER LIMITED IRRIGATION,
New Mexico State Univ., Clovis. Plains Branch Agricultural Experiment Station.
H. D. Fuehring.
Agronomy Journal, Vol 65, No 3, p 348-351, 1973.

Descriptors: *Antitranspirants, *Crop production, *Sorghum, Irrigation, Stomata, Grain(Crops).
Identifiers: Atrazine, Folicote, Phenylmercuric acetate.

The proper material, method and timing of application for field use was determined. Under limited irrigation conditions in the field, grain sorghum (Sorghum bicolor (L) Moench) was sprayed at various rates and times with phenylmercuric acetate (PMA), atrazine and Folicote. Mean grain yield increases of 5-17% were obtained. Rates of application required were approximately 60 g/ha for PMA, 130 g/ha for atrazine, and 2 l/ha for Folicote. Application just prior to the boot stage was more effective than a later application.--Copyright 1973, Biological Abstracts, Inc.
W75-10858

INTERNATIONAL DEVELOPMENT STRATEGIES FOR THE SAHEL.
For primary bibliographic entry see Field 4A.
W75-10861

SUCCESSFUL IRRIGATION: PREPARATION, REALIZATION, EXPLORITATION, (SAVOIR IRRIGUER: PREPARATION, REALISATION, EXPLOITATION),
California Univ., Davis. Dept. of Irrigation.
R. M. Hagan, C. E. Houston, and S. V. Allison.
Food and Agriculture Organization of the United Nations, Rome, 1968. 53 p.

Descriptors: *Irrigation programs, *Planning, *Management, *Institutions, *Project planning, Costs, Economic feasibility, Water utilization.

Successful irrigation, its planning, development, and management, are described to assist policy makers, administrators, and planners to discharge more effectively their roles in the development of irrigated agriculture. Successful irrigation requires a skillful combination of the accumulated knowledge in many professional field, including engineering, water-soil-plant sciences, and economic and other social sciences. Guidelines are suggested for the preparation of project proposals, their appraisal, and implementation. The subsequent management calls for experienced judgement, gased on a high degree of professional competence. (Paylore-Arizona)
W75-10874

SPRINKLER IRRIGATION PRACTICE, (LA PRATIQUE DE L'IRRIGATION PAR ASPERSION),
California Univ., Los Angeles. Water Resources Center.
A. F. Pillsbury, and A. Degan.
Food and Agriculture Organization of the United Nations, Rome, FAO Agricultural Development Paper, No 88, 1968. 186 p, 66 fig, 88 refs.

Descriptors: *Sprinkler irrigation, *Irrigation practices, *Operation and maintenance, *Hydraulic equipment, *Pumps, Water distribution(Applied), Irrigation systems, Costs, Corrosion, Scaling, Design criteria, Rotational flow.

Discussed are types of land best suited to sprinkler irrigation; types of sprinklers (slow rotation, reaction rotation, nozzle lines, perforated pipe, and fixed head sprinklers); types of sprinkler systems (hand-move, portable, semi-portable, permanent, roll-move, tow units, drag units, solid set, and traveling machines); suitable environments such as soil texture and density, moisture suction, humidity, wind, and evaporation; sprinkler patterns as they relate to uniform coverage; system design and operational criteria, with special reference to problems induced by corrosion; system hydraulic design; pumping plant design; installation, operation, and maintenance; sprinkling in greenhouses; factors such as pesticides, fertilizers, and frost; and economic considerations. (Paylore-Arizona)
W75-10875

THE EARLY VEGETATIVE GROWTH OF TWO ANNUAL PASTURE GRASSES (HORDEUM

LEPORINUM LINK AND LOLIUM RIGIDUM GAUD.),
South Australia Dept. of Agriculture, Adelaide.
P. S. Cocks, and C. M. Donald.
Australian Journal of Agricultural Research, Vol 24, No 1, p 11-19, January, 1973. 3 fig, 5 tab, 11 ref.

Descriptors: *Germination, *Plant growth, *Seeds, *Grasses, *Planting management, Soil-water-plant relationships, *Australia, Weight, Leaves, Root systems, Plant physiology, Vegetation establishment.
Identifiers: Hordeum Leporinum Link, Lolium regidum Gaud.

Early vegetative growth of Hordeum leporinum and Lolium rigidum was studied at 10, 17, and 24C in a controlled environment cabinet. Growth rates for Lolium were generally higher than for Hordeum, and significantly so at 17C. Seedling growth rate in each species was more rapid during the period of endosperm availability than after endosperm exhaustion. Following emergence, Hordeum seedlings were larger in total weight, leaf area, root weight, root depth and plant height because of their greater seed size. The duration of Hordeum's greater size depended upon temperature, being least (26 days) at 17C, the temperature for Lolium's optimum growth. Implications of these findings in pasture production in southern Australia are that in sparse stands Lolium seedlings will overtake Hordeum, and in dense stands the reverse will occur. (Michael-Arizona)
W75-10876

WATER CONSUMPTION AND WATER TURNOVER OF SHEEP GRAZING SEMIARID PASTURE COMMUNITIES IN NEW SOUTH WALES,
Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Riverina Lab.
A. D. Wilson.
Australian Journal of Agricultural Research, Vol 25, No 2, p 339-347, March 1974. 4 fig, 3 tab, 18 ref.

Descriptors: *Sheep, *Water consumption, *Grasses, *Water requirements, Pastures, Vegetation effects, Grazing, *Australia, Rainfall, Grasslands.
Identifiers: Water turnover, Shade.

Water consumption and turnover of Merino sheep grazing on three vegetation communities were studied. Water requirements are high due to high temperatures and low moisture content of the forage in the dry season. On Danthonia caespitosa grassland, maximum water intakes were 3 to 3.5 liters per sheep per day. On saltbush (Atriplex vesicaria) and belah-rosewood (Casuarina cristata - Heterodendrum oleifolium) communities, water intakes were up to 6 to 7 liters per day in summer. The provision of shade reduced water turnover by a maximum of 0.3 to 0.5 liters per day on some occasions only, indicating that shade is of little importance of woolled sheep. Water turnover was measured by tritium dilution. The high water intakes of the sheep were attributed mainly to the high mineral content of the Atriplex and Bassia spp. eaten. Shearing in the cool season is clearly a sound practice in this region of New South Wales. (Mastic-Arizona)
W75-10888

THE INFLUENCE OF DENSITY AND NITROGEN ON THE OUTCOME OF COMPETITION BETWEEN TWO ANNUAL PASTURE GRASSES (HORDEUM LEPORINUM LINK AND LOLIUM RIGIDUM GAUD.),
South Australia Dept. of Agriculture, Adelaide.
P. S. Cocks.
Australian Journal of Agricultural Research, Vol 25, No 2, p 247-258, March 1974. 6 fig, 4 tab, 17 ref.

Descriptors: *Competition, *Nitrogen, *Pastures, *Grasses, *Plant growth, Density, *Australia, Growth rates.
Identifiers: Hordeum leporinum Link, Lolium rigidum Gaud.

The hypothesis that the outcome of competition between Hordeum leporinum Link. and Lolium rigidum Guad. depends mainly on the density of the Hordeum in a pasture was tested. The results are explained in terms of the hypothesis and of the different abilities of the two species to absorb soil nitrogen, which is rarely applied to annual pastures and often deficient. In the first experiment, it was found that the competitive ability of Hordeum was closely related to its density. Hordeum was most competitive when its density was highest. In the second experiment, soil nitrogen was an important modifying factor. At low nitrogen, Hordeum was the successful competitior, and its competitive ability decreased with increases in its density. At high nitrogen, Lolium became the successful competitor. (Mastic-Arizona)
W75-10889

PRODUCTS FROM JOJOBA: A PROMISING NEW CROP FOR ARID LANDS.
National Research Council, Washington, D.C. Committee on Jojoba Utilization.
National Academy of Sciences, 1975. 30 p, 8 fig, 7 tab, 11 ref.

Descriptors: *Indian reservations, *Southwest, US, *Desert plants, Arid lands, Water requirements, Cultivation, Crop production, Hydrogenation, Productivity, Wax, Seeds, Seed treatment.
Identifiers: *Jojoba, *Economic plants, Plant uses.

In the expectation that an industry based on the seed oil of the desert bush jojoba (Simmondsia chinensis) would improve the economies of Indian reservations in the southwestern desert regions of the U.S., a scientific and technical assessment was made of the practical uses of jojoba oil. The cultivation of jojoba, the manufacture of products from it, and the utilization of its by-products are discussed, with the conclusion that jojoba oil and its hydrogenated product have marketable properties. Special attention is directed to its value to increase productivity of arid lands not suitable for conventional crops, particularly because of its tolerance to extreme desert temperatures and minimal rainfall. Since the plant needs moisture during the winter and spring, its growth schedule fits well with an arid environment where water is needed when it is scarce. It appears to be tolerant of both saline and alkaline soils and to saline irrigation water. The 1972 harvest of 87,000 pounds of seed from wild plants was used for the laboratory work done to support the Committee's conclusions, but the future of the plant lies in developing it into a cultivated crop. Accompanying tables illustrate the wax and protein content of jojoba seeds, characteristics of sulfurized jojoba and sperm oils, and other comparisons. (Paylore-Arizona)
W75-10890

SALT AND SPECIFIC ION EFFECTS ON GERMINATION OF FOUR GRASSES,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
For primary bibliographic entry see Field 2K.
W75-10894

OCCURRENCE OF 2, 4, 5-T AND PICLORAM IN SURFACE RUNOFF WATER IN THE BLACKLANDS OF TEXAS,
Agricultural Research Service, College Station, Tex.
For primary bibliographic entry see Field 5B.
W75-10895

THE GERMINATION AND ESTABLISHMENT OF TWO ANNUAL PASTURE GRASSES (HORDEUM LEPORINUM LINK AND LOLIUM RIGIDUM GAUD.),
South Australia Dept. of Agriculture, Adelaide.
For primary bibliographic entry see Field 2I.
W75-10897

EFFECT OF SOIL-WATER RELATIONS ON THE ROOT POROSITY, TRANSPIRATION AND ION UPTAKE IN RICE,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Soil Science.
A. K. Saha, B. P. Ghildyal, and M. S. Gangwar.
Indian J Agric Sci, Vol 43, No 5, p 472-477, 1973.

Descriptors: *Roots, *Soil water, *Transpiration, Ions, Absorption, *Rice, Porosity, Loams, Dry matter, Production, Soils.
Identifiers: Oryza-Sativa, *India.

A pot experiment was conducted on a silty clay-loam soil of Nainital tarai (subhumid and submontane belt at the base of the Himalayas) to investigate the influence of soil-water regimes on rice (Oryza sativa L.) cultivars 'Jaya' and 'IR 8,' grown under flooded condition and field capacity. A variation in the soil-moisture regimes from field capacity to flooded condition resulted in a great increase in the total root porosity, transpiration, nutrient uptake and dry matter production. Dry matter production and nutrient uptake showed a high positive correlation with the total amount of water transpired. The amount of water transpired/day/plant was positively correlated with the total root porosity/plant. More nutrient uptake as a result of increased availability of nutrients, together with greater transpirational transfer of water and ions facilitate by increased root porosity, resulted in an increase in the growth of rice plant under flooded condition.--Copyright 1974, Biological Abstracts, Inc.
W75-10916

ESTIMATION OF SAFE PERIODS FOR CROP PLANNING UNDER DRYLAND AGRICULTURE,
All-India Coordinated Dryland Agriculture Research Project, Hissar.
O. P. Bishnoi, and S. M. Virmani.
Indian J Agric Sci. Vol 43, No 5, p 429-432, 1973.

Descriptors: *Agriculture, *Crop production, Planning, Plant management, Estimating, *Dry farming.

At Hissar a 90-day (18 June-14 Sept.) safe period of water availability for the rainy crop season was determined using normal weekly values of precipitation at the different significant levels of potential evapotranspiration. For the winter crop season this period was 110-120 days as estimated from plant response to the soil-moisture regime, depending on the meteorological and moisture-release parameters under conditions of stored moisture.--Copyright 1974, Biological Abstracts, Inc.
W75-10926

AN APPRAISAL OF POTENTIAL WATER SALVAGE IN THE LAKE MCMILLEN DELTA AREA, EDDY COUNTY, NEW MEXICO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 3B.
W75-10941

USE OF AMENDMENTS TO REDUCE WATER REQUIREMENTS FOR STAND ESTABLISHMENT OF SMALL-SEEDED CROPS,
Arizona Univ., Tucson. Dept. of Plant Sciences.
R. E. Dennis, C. E. Edmond, and C. W. Robbins.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 722,

$3.75 in paper copy, $2.25 in microfiche. Completion Report, August 1975. 15 p, 16 ref. OWRT A-034-ARIZ(3). 14-31-0001-5003.

Descriptors: Soils, Alfalfa, Sugarbeets, *Soil amendments, *Southwest U.S., Wheat, Barley, Irrigation water, Water requirements.
Identifiers: *Sulfuric acid, *Phosphoric acid, *Soil crusting.

Soil crusting after planting is a serious problem in stand establishment of small-seeded crops in the Southwest. When crusting occurs in a saline, warm soil, stand establishment problems are especially severe. It is customary to use costly irrigation water to keep seedbed surfaces moist after planting to reduce soil crusting, and to lower soil temperatures. Phosphoric acid (24% and 12%) and sulfuric acid (95%) were evaluated to determine their effectiveness in reducing soil crusting and to reduce the amount of water required to obtain stands of sugarbeets, alfalfa, wheat and barley. Phosphoric acid applied in 4-6 cm bands over the seed row at planting and before irrigation, reduced crusting and significantly increased sugarbeet and alfalfa seedling emergence. Emerged seedlings from phosphoric acid treated plots were larger and one irrigation (10-15 ha cm/ha) was saved in stand establishment. Sulfuric acid applied in bands reduced soil crusting. Soluble salts in the seed zone resulting from band application of sulfuric acid killed or damaged seedlings. Sulfuric acid when applied in irrigation water, to saline-sodic soils, improved plant growth and water use efficiency.
W75-11045

SCHEDULING AND APPLICATION RATES OF IRRIGATION IN A HUMID CLIMATE,
Alabama Agricultural Experiment Station, Auburn.
C. D. Busch, and E. W. Rochester.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 760, $3.75 in paper copy, $2.25 in microfiche. Bulletin 470, Agricultural Experiment Station, Auburn University, June 1975. 38 p, 10 fig, 6 tab, 15 ref, 5 append. OWRT A-025-ALA(3).

Descriptors: Irrigation, Weather forecasting, *Rates of application, *Application methods, *Irrigation practice, *Humid climates, *Supplemental irrigation, Soil moisture, Water demand, Crop production, *Cotton, On site investigation.
Identifiers: Simulation studies, Irrigation by demand, Irrigation scheduling.

A four-year study of two irrigation scheduling methods and application rates was conducted to determine more efficient uses of supplemental water in a humid climate. One model based on the decision to irrigate on weather forecast and soil moisture conditions; the other, irrigation by demand, based on soil moisture conditions only. Two application rates of 0.13 in/hr (low) and 0.43 or 0.7 in/hr (high) were used. A computer program was developed to calculate soil moisture and predict irrigation needs in the forest scheduling model. A 0.5 probability of rainfall greater than 0.5 inch was the low limit. The weather forecast also provided the basis of deciding how much rainfall would be included in the soil moisture balance. The inclusion of weather forecast was insignificant. However, irrigation in itself did improve yields. The method of irrigation by demand improved production 160 lbs. of seed cotton per acre for each inch of water applied. Simulation studies following the field experiment supported the results of the field study. In the associated application rate study the low application rate of 0.13 inches per hour was superior in cotton production and in the minimization of soil crust strength. The study also suggested that an exponential relation is appropriate for relating crust strength to crust moisture content.
W75-11048

CONSOLIDATION AND REHABILITATION OF CANALS IN POUDRE VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W75-11061

CULTIVATION OF NETTED MELON BY USE OF TRICKLE IRRIGATION IN A SAND FIELD PLASTIC GREENHOUSE, (IN JAPANESE),
Tottori Univ. (Japan). Sand Dune Research Inst.
T. Cho, T. Yamamoto, and Y. Takeuchi.
Sand Dune Research Institute, Bulletin No 14, p 1-8, March 1975 2 fig, 3 tab, 8 ref. English summary.

Descriptors: *Greenhouses, *Sands, *Irrigation, *Irrigation effects, Dunes, Sprinkler irrigation, Irrigation practices, Irrigation systems, Agronomic crops, Plant growth, Plastics, Fertilization, Application methods.
Identifiers: *Trickle irrigation, *Japan.

Two varieties of netted melon, Earls Favorite and Shinhoro, growing in plastic greenhouses in a sand field, were irrigated using the trickle irrigation method. Net fruit development and sugar content of Earls Favorite were greater using trickle irrigation than that obtained using sprinkler irrigation methods. Net development of the fruit of Shinhoro was greater on single vine plants than on two, three, or four vine plants. By examining and correlating nozzle flow rates, trickle times, and liquid fertilizer applications involved in trickle irrigation systems, new methods for netted melon cultivation may be developed. (Frondorf-Arizona)
W75-11095

NOZZLE HYDRAULICS IN THE TRICKLE IRRIGATION SYSTEM--RELATION BETWEEN WATER TEMPERATURE AND NOZZLE FLOW RATE (IN JAPANESE),
Tottori Univ. (Japan). Sand Dune Research Inst.
T. Yamamoto, and H. Kawasaki.
Sand Dune Research Institute, Bulletin No 14, p 9-14, March 1975 7 fig, 2 tab, 3 ref. English summary.

Descriptors: *Irrigation, *Application methods, *Rates of application, *Flow rates, *Nozzles, Sprinkler irrigation, Irrigation practices, Irrigation systems, Pressure, Flow, Water temperature.
Identifiers: *Trickle irrigation, *Japan.

The flow rate of the trickle nozzle which connects with the distribution pipe of a trickle irrigation system is dependent on pressure, water temperature, and the dimensions of the spiral flow path. The pressure and dimensions of the spiral flow path constant, nozzle flow rate varies with water temperature, which acts on the kinematic viscosity coefficient. A formula for the calculation of nozzle flow rate at any given temperature is presented. Calculated values are found to agree well with experimentally determined values. (Frondorf-Arizona)
W75-11096

PRACTICAL APPLICATION OF SURFACE FIXED-SYSTEM FOR MULTI-PURPOSE SPRINKLER IRRIGATION USES, (IN JAPANESE),
Tottori Univ. (Japan). Sand Dune Research Inst.
T. Cho, T. Yamamoto, Y. Takeuchi, Y. Nomura, and M. Inoue.
Sand Dune Research Institute, Bulletin No 14, p 15-24, March 1975 7 fig, 6 tab, 4 ref. English summary.

Descriptors: *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, *Distribution systems, *Application methods, Irrigation practices, Irrigation systems, Fertilizers, Pesticides, Fertilization.
Identifiers: *Japan.

An investigation of the multiple uses of a surface fixed-system sprinkler irrigation system, including application of liquid fertilizers and pesticides was conducted. Uniformity coefficient and pattern efficiency of the sprinkler system were computed by measuring the height of water caught in cans. These two factors were then used to estimate the sprinkler distribution efficiency. Investigations of the ratio of wetting area of chemical spray to leaf area, for different sprinkler types and for different amounts of spray, were conducted on Dioscorea opposita (chinese yam) and Raphanus sativus (radish). It is concluded that the fixed-system is a feasible sprinkler irrigation method for multiple uses. (Frondorf-Arizona)
W75-11097

IMPROVING PRODUCTIVITY IN LOW RAINFALL AREAS, IN INDIA.
Food and Agriculture Organization of the United Nations, Rome (Italy).
Food and Agriculture Organization of the United Nations, Rome, Italy. COAG/74/4, Appendix 1, April, 1974. 16 p, 2 tab.

Descriptors: *Farm management, *Arid climates, *Land use, *Land management, *Dry farming, Productivity, Plant growth, Climatic zones, Dry seasons, Semiarid climates, Soil types, Soils, Land tenure, Groundwater, Rainfall, Infiltration, Runoff, Crop production, Education, Arid lands, Water utilization, Wells, Fertilizers, Planting management.
Identifiers: *India.

A general overview is given of climate, soils, land and culture of areas in India where agricultural projects are under study. These 54 projects in low rainfall areas comprise 30 percent of India's cultivated land area. The study is aimed at determining the most efficient and non-wasteful use of water from wells and rainfall. Crop production techniques, crop varieties, use of fertilizers, planting and after care are examined. Animal husbandry works best in certain climatic and vegetative areas and can be improved through irrigation. Programs of agricultural extension, education, and a federal farm credit program have provided assistance to the participants in the projects. Tables are given on projects, crops grown, yields, and yield increases. The objectives, organization and staffing patterns of dryland research centers and integrated dryland development projects of India are described. (Miller-Arizona)
W75-11099

THE EFFECT OF IRRIGATION ON THE YIELD AND QUALITY OF MAINCROP POTATOES,
L. W. Wellings.
Exp Husb, 24 p 54-69, 1973. Illus.

Descriptors: *Irrigation, Crop production, *Potatoes, *Soil moisture.
Identifiers: *Streptomyces-Scabies.

Irrigation significantly increased yield in 4 of the 6 experiments with large increases in 2 seasons. On average irrigation throughout the growing season when soil moisture deficit (S.M.D.) reached 55% of the available water capacity (A.W.C.) in the top 30 cm of soil, or irrigation when S.M.D. reached 45% A.W.C. for 4-6 wk after tuber initiation followed by irrigation when S.M.D. reached 100% A.W.C., tended to give higher yields than irrigation at S.M.D.'s of 100-140% A.W.C. after the tubers had reached a diameter of 10-20 mm. Irrigation improved the quality of tubers by decreasing the level of common scab (Streptomyces scabies) and frequent irrigation for 4-6 wk from tuber initiation gave high yields of scab-free tubers from susceptible varieties. Results in 2 yr when there were large responses indicated that 'Majestic' and 'Record' need more frequent irrigation than 'King Edward' and 'Pentland Crown' to produce their best yields. The results are used to indicate a system of irrigation for commercial production of high quality potatoes from light land.--Copyright 1974, Biological Abstracts, Inc.

W75-11106

LAND AND WATER RESOURCES SURVEY IN THE JEBEL MARRA AREA, THE SUDAN,
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 4A.
W75-11139

AVAILABLE WATER-HOLDING CAPACITIES OF SOILS IN SOUTHERN IDAHO,
Idaho Agricultural Experiment Station, Aberdeen.
For primary bibliographic entry see Field 2G.
W75-11140

AN IMPLICIT APPROACH TO PRICING AGRICULTURAL WATER TRANSFERS TO URBAN USES,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W75-11178

GENERATION OF ARID ZONE RAINFALL AND RUNOFF,
University of New England, Armidale (Australia). School of Natural Resources.
For primary bibliographic entry see Field 2A.
W75-11303

THE ROLE OF ENDOGENOUS ABSCISIC ACID IN THE RESPONSE OF PLANTS TO STRESS,
Royal Univ. of Malta, Valletta. Dept. of Chemistry.
R. W. P. Hiron, and S. T. C. Wright.
J Exp Bot. Vol 24, No 81, p 769-781, 1973, Illus.

Descriptors: *Plant physiology, *Beans, *Leaves, *Wilting, Dehydration, Stomata, Tomatoes, Wheat, Rice, Flooding.
Identifiers: *Abscisic acid, Glucose ester, Lycopersicon-esculentum, Oryza-sativa, Phaseolus-vulgaris, Triticum-aestivum, *Turgor, *Warm air.

When a continuous stream of warm air (38C) was directed on to the leaves of dwarf bean (Phaseolus vulgaris) seedlings they wilted and then gradually regained turgor. This process of adaptation was accompanied by an increasing abscisic acid (ABA) level in the leaves and an increase in leaf resistance (RL). It is suggested that the leaf-water deficit induced by the warm-air treatment caused the increase in ABA level and that the latter was responsible for stimulating stomatal closure, enabling the plants to regain full turgor. A similar type of adaptation, brought about by an increased level of ABA in the leaves, is believed to occur in tomato (Lycopersicon esculentum), dwarf bean, and wheat (Triticum aestivum) plants when they are flooded. Predictably, in rice (Oryza sativa), a species adapted to a flooded environment, seedlings showed no increase in ABA level as a result of flooding. Adaptation may involve the formation of an equilibrium between ABA and its conjugate form (i.e. the glucose ester). The ABA-conjugate was observed to disperse slowly from leaves recovering from a water deficit; and therefore it may act as a metabolic 'back-stop,' enabling the 'free' ABA to remain high for a period even when the leaves have regained turgor. Abscisic acid appears to be responsible for alleviating the effects of water stress in plants, making it possible for plants to pass through periods of stress with little harm.--Copyright 1974, Biological Abstracts, Inc.
W75-11319

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

COVARIANCE ANALYSIS OF RESERVOIR DEVELOPMENT EFFECTS ON PROPERTY TAX BASE,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6B.
W75-10851

SOCIAL IMPACTS OF WATER RESOURCES DEVELOPMENTS AND THEIR IMPLICATION FOR URBAN AND RURAL DEVELOPMENT: A POST AUDIT ANALYSIS OF THE WEBER BASIN PROJECT IN UTAH,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
For primary bibliographic entry see Field 6B.
W75-10854

DIFFERENTIAL RELEASE OF WATER FROM ARIZONA SNOWPACKS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2C.
W75-10860

INTERNATIONAL DEVELOPMENT STRATEGIES FOR THE SAHEL.
Rockfeller Foundation Report, May 1975. 50 p, 3 fig, 14 ref. Conference held at Bellagio, Italy, October 1974.

Descriptors: *Regional development, *Droughts, *Weather patterns, *River basin development, Water management(Applied), Administration, Research and development, Transportation, Education, Population, Livestock, Carrying capacity, Limiting factors, Arid lands, Environmental effects, *Africa.
Identifiers: *Sahelian zone, Nomadism.

This conference was devoted to an examination of the needs for achievement of long-term development of the Sahel, establishment of priorities, and means for implementation. Interest focussed on the existing Comite' Inter-Etats de Lutte Contre la Secheresse as Sahel (CILSS). Its programs based on participation by Chad, Gambis, Mali, Mauritania, Niger, Senegal, and Upper Volta, include a regional study of water management, including river basin development; transport and communications; improvement of genetic stock; reforestation; and a special development fund. The conference recommended the following strategies: (1) Infrastructure development, emphasizing road and water basin development, (2) improved participation of local people, including mass communications and education to help the people cope with their own needs, (3) long-term development, (4) resource management, (5) bringing nomadic life into better balance with the carrying capacity of the land and the availability of renewable and non-renewable resources, (6) establishment of a regional Sahelian Institute to aid in research and development by catalyzing and mobilizing resources in the long term to bring about an improvement in the quality of life for its people. The recent drought, degradation of the environment throughout the region, and a recognition of the differences between emergency relief and long-term local management of what was acknowledged as a recurring phenomenon were additional topics for discussion. Summaries are included of papers on Weather and Climate in the Sahel, and Environmental Management. (Paylore-Arizona)
W75-10861

SHRUB TRANSPLANTING FOR WATERSHED MANAGEMENT AND RANGE IMPROVEMENT IN IRAN,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 4D.
W75-10870

THE INFLUENCE OF RAINFALL ON THE REPRODUCTION OF SONORAN DESERT LAGOMORPHS,
Arizona Univ., Tucson. Dept. of Biological Sciences.
R. L. Madsen.
Arizona University, Tucson, Department of Biological Sciences, MS Thesis, 1974. 60 p, 11 fig, 5 tab, 4 append, 15 ref.

Descriptors: *Herbivores, *Competition, *Rainfall, *Rainfall intensity, *Arizona, *Range management, Arid climates, Semiarid climates, Mammals, Small animals(Mammals), Wildlife, Grazing, Moisture deficit, Reproduction.
Identifiers: *Avra Valley(Ariz), *Lagomorphs.

Lagomorphs have long been recognized as important herbivores in the Sonoran desert. They are the chief competitors with cattle for the sparse grazing and available water in the southwest. Their size and mobility increase the effect they can have on their habitat. During the period of March 1971 to December 1973 lagomorphs were collected from Avra Valley, Arizona. Reproduction activity was highest during January-March and again in July-August. This roughly corresponds with the rainy seasons of the Sonoran Desert. The variance of rainfall during this period corresponded with the decline and rise in the lagomorphs' population. Lack of rainfall often caused high mortality rates or forced migration, while normal rainfall increased the population and competition for grazing and water. (McLachlan-Arizona)
W75-10871

INTERBASIN WATER TRANSFERS: A CASE STUDY IN MEXICO,
Resources for the Future, Inc., Washington, D.C.
R. G. Cummings.
Distributed by The John Hopkins University Press, Baltimore, Md 1974 114 p.

Descriptors: *Inter-basin transfers, *Water transfer, *Water resources development, *Mexico, Imported water, Mexican water treaty, Economic impact, Economic justification, Mathematical models, Equations, Model studies, Urban sociology, Rural sociology, Cost-benefit analysis, Groundwater, Groundwater mining, Water table, Pumping, Project planning, Project benefits, Project purposes, Planning.
Identifiers: Northwest Water Plan, Yaqui Valley(Mexico), Costa de Hermosillo(Mexico).

The state of interbasin water transfers in Mexico is explained with detailed description of the current Northwest Project, including the project's conceptual structure and implied directions. A model which gives patterns of water transfer is evaluated for a representative year, treated parametrically from optimum pumping levels and optimal rates of pumping in the Costa de Hermosillo area. Results are applied to projections for interbasin water transfer developments. Net benefits from and costs of the water are examined in light of economic relations between the rural and urban sectors in the study region. An analysis of representative year transfers is presented and the optimum intertemporal exploitation of the Costa Aquifer is discussed. Conclusions are presented and discussed. (Miller-Arizona)
W75-10879

ESTABLISHING ALKALI SACATON ON HARSH SITES IN THE SOUTHWEST,
Forest Service, (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.

E. F. Aldon.
Journal of Range Management, Vol 28, No 2, p 129-132, March 1975, 2 fig, 2 tab, 14 ref.

Descriptors: *Grasses, *Vegetation establishment, *Seed treatment, *Soil moisture, *Germination, *Reproduction, Viability, Mulching, *New Mexico, Range management, Southwest US.
Identifiers: *Alkali sacaton.

Despite previous unsuccessful trials in planting alkali sacaton (Sporobolus airoides (Torr.) Torr) on badly eroded sites in flood plains in the semi-desert of the Southwest, experiments conducted under field conditions on the Rio Puerco drainage of northwestern New Mexico proved that this grass can be grown successfully under exacting conditions: (1) plant when soil moisture is at least 14 percent or higher (1 atm tension or less), (2) plant when probabilities for weekly precipitation are greater and soil temperatures will be near 30 degrees C, (3) use large seeds at least 1 year old, (4) saturate the planting site just prior to planting, (5) cover seeds with about 13 mm of mulch to keep them moist and dark, and (6) if storms at planting site do not deposit at least 6 mm of rain within the first 5 days, rewater to bring the soil to saturation. If properly manages, alkali sacaton provides valuable forage and can effectively lower sediment losses. Management steps, outlined above, are based on results that show maximum conditions for survival, taking advantage of summer precipitation when seeds are mature, and the ability of seeds to emerge through as much as 4 cm of sediment deposited during runoff from sudden summer thunderstorms. (Paylore-Arizona)
W75-10882

STABILIZATION AND RECONSTRUCTION OF TEXAS COASTAL FOREDUNES WITH VEGETATION,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 2L.
W75-10887

PRODUCTS FROM JOJOBA: A PROMISING NEW CROP FOR ARID LANDS.
National Research Council, Washington, D.C. Committee on Jojoba Utilization.
For primary bibliographic entry see Field 3F.
W75-10890

APPROXIMATE ANNUAL WATER BUDGETS OF TWO CHAINED PINYON-JUNIPER SITES,
Utah State Univ., Logan. Watershed Science Unit.
G. S. Gifford.
Journal of Range Management, Vol 28, No 1, p 73-74, January 1975. 1 tab, 5 ref.

Descriptors: *Water balance, *Runoff, *Interception, *Vegetation effects, Soil moisture, Pinyon pine trees, Juniper trees, *Utah, Rainfall, Semiarid climates, Precipitation, Seepage, Hydrologic budget.
Identifiers: Chaining.

Two chained pinyon-juniper sites in Utah were studied to obtain an approximate water balance for each of these treatments at each site: natural woodland, chaining-with-debris-in-place, and chaining-with windrowing. Results indicate that most of the annual precipitation falling on each treatment is lost through evapotranspiration, with much of the remainder being lost through interception. When runoff did occur, it was greatest from the windrowed treatments and least from the debris-in-place treatments. The range of annual rainfall for the two sites was about 8 to 11.5 inches. Deep seepage was zero in all cases. (Mastic-Arizona)
W75-10896

THE LAW OF WATER ALLOCATION IN KENTUCKY,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6E.
W75-10898

TWO-DIMENSIONAL, HYDROSTATIC SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W75-10901

FLOOD RUNOFF FROM URBAN AREAS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-10904

ENVIRONMENTAL IMPACT EVALUATION IN FRESHWATER IMPOUNDMENTS BY VEGETATION ANALYSIS OF THE TERRESTRIAL ECOSYSTEM,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 2I.
W75-10905

THERMAL RESPONSE OF HEATED STREAMS, SOLUTION BY THE IMPLICIT METHOD,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W75-10909

AUTOMATED DISTRIBUTION OF GAUGE AND SHIFT CORRECTIONS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10911

AUTOMATED TIDAL COMPUTATIONS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10912

FLOW FILE OPERATIONS MANUAL,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10913

AUTOMATED HOURLY COMPUTATIONS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W75-10915

PREDICTING RECESSIONS THROUGH CONVOLUTION,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
For primary bibliographic entry see Field 2E.
W75-10917

WIND EFFECTS ON CHEMICAL FILMS FOR EVAPORATION SUPPRESSION AT LAKE HEFNER,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3B.
W75-10920

SUBSURFACE FLOW FROM SNOWMELT TRACED BY TRITIUM,
Swiss Federal Inst. for Snow and Avalanche Research, Davos-Weissfluhjoch.
For primary bibliographic entry see Field 2F.
W75-10921

RELATIVE IMPORTANCE OF DECISION VARIABLES IN FLOOD FREQUENCY ANALYSIS,
IBM Watson Research Center, Yorktown Heights, N.Y.
J. R. Wallis, and N. C. Matalas.
In: Proceedings of Symposium on the Design of Water Resources Projects with Inadequate Data, Volume 1; Madrid, June 1973, sponsored by UNESCO-WMO-IAHS: Comite Espanol para el D H I, p 435-442, 1973. 9 tab, 1 ref.

Descriptors: *Probability, *Monte Carlo method, *Flood frequency, Simulation analysis, Statistical models, Decision making, Flood control.

Monte Carlo simulations were used to assess flood and overdesign losses that result from differing choices of assumed frequency distribution, plotting position, criterion of best fit and length of record. The probability of the event that a sequence, having a particular element of the real world set as its underlying distribution, is best fitted by a particular element of imagined world set, relative to a particular method of assigning exceedance probabilities and a particular criterion of best fit, was estimated by N/18,000, where N denotes the number of times the event occurred and 18,000, the total number of times the event could have occurred. (Knapp-USGS)
W75-10929

STREAMFLOW IN THE NEW YORK PART OF THE SUSQUEHANNA RIVER BASIN,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 2E.
W75-10931

ESTIMATED AVAILABILITY OF SURFACE AND GROUND WATER IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
L. J. Reiland, and F. C. Koopman.
Open-file report 74-151, June 1975. 35 p, 2 fig, 8 tab, 3 ref.

Descriptors: Water resources, *Streamflow, *Groundwater resources, *Hydrologic data, *New Mexico, Water measurement, Discharge(Water), Water yield, Water wells, Withdrawal, Aquifer characteristics, Water levels, Drawdown, Regression analysis.
Identifiers: *Santa Fe County(N Mex), Pojoaque River basin(N Mex).

The natural flow is computed for the Pojoaque River at several points along its course in Santa Fe County, N. Mex., on a monthly basis for the period 1935-72. The recorded flow is tabulated for the Rio Grande at Otowi gaging station on a monthly basis for the period 1935-72. Computations were made to determine the volume of groundwater that could be withdrawn from the Pojoaque River drainage basin, assuming drainage of the aquifer was to depths of 500, 1,000, and 1,500 feet. The results indicate that 3,300,000 acre-feet of water could be withdrawn by draining the aquifer to a depth of 500 feet; 9,500,000 by draining the aquifer to a depth of 1,000 feet; and 14,900,000 by draining the aquifer to a depth of 1,500 feet. (Woodard-USGS)
W75-10938

LOW-FLOW CHARACTERISTICS OF SELECTED STREAMS IN NORTHEASTERN WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2E.
W75-10939

ESTIMATED MEAN-MONTHLY AND ANNUAL RUNOFF AT SELECTED SITES IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2E.
W75-10943

HIERARCHIAL MODEL FOR WATER-SUPPLY-SYSTEM CONTROL,
Cambridge Univ. (England). Dept. of Engineering.
F. Fallside, and P. F. Perry.
Proceedings of the Institution of Electrical Engineers, Vol 122, No 4, p 441-443, April 1975. 4 fig, 1 tab, 11 ref.

Descriptors: Analytical techniques, *Water supply, *Model studies, *Computers, *Control systems, Telemetry, Forecasting, Simulation analysis, *Computer models, *Water distribution(Applied).
Identifiers: Hierarchical computer models.

A collaborative university-industry research project is being conducted for the introduction of an online computer control system for a water supply network in the United Kingdom. Aspects of the problem of water distribution include modelling and simulation, consumption forecasting, waste detection, and optimal control. Each can be considered as a set of interacting subproblems, within which control effort is subdivided into a hierarchy of control function of ascending complexity. The scheme provides a framework for overall control of the network including optimal pumping control, short term demand forecasting and anomalous-load detection, each to be performed online on a central computer and implemented at the plant by a telemetry scheme. Details of each layer of control is described and proposed implementation via linked computers is discussed. The multilayer concept of control includes control activities associated with a regulator layer, an optimizing layer, an adaptive layer to compensate for disturbances or model induced errors, and a self-organizing control function, which gives feedback on the control-system design. (Prague-FIRL)
W75-10996

COST EVALUATION OF WATERCOURSE MANAGEMENT IN ESSEX,
Cambridge Univ. (England). Dept. of Applied Biology.
For primary bibliographic entry see Field 5G.
W75-11008

FRESHWATER ECOSYSTEM RESEARCH IN WATER QUALITY MANAGEMENT,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 6G.
W75-11012

AN ASSESSMENT OF SNOWPACK DEPLETION-SURFACE RUNOFF RELATIONSHIPS ON FORESTED WATERSHEDS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
P. F. Ffolliott, and D. B. Thorud.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 697, $3.25 in paper copy, $2.25 in microfiche. Completion Report, August 1975. 4 p, 5 ref. OWRT A-045-ARIZ(3). 14-31-001-5003.

Descriptors: *Snowmelt, *Forest watersheds, *Computer models, *Simulation analysis, *Water sources, *Arizona, Forest management, Runoff, Watershed management, Water supply, Small watersheds, Forecasting.
Identifiers: *Snowmelt runoff, *Forest management guidelines, New water supply.

A technique was developed for determining daily values of snowmelt runoff efficiencies (i.e., the portion of a snowpack that is converted into recoverable water) from small forested watersheds by coupling a computer program that stimulates Arizona snowmelt processes with graphical procedures of runoff hydrograph separation. Employing this technique, seven watersheds with 14 years of record were used in evaluating changing patterns of snowmelt runoff efficiences within a year. Additionally, an array of physical, biological, and climatic variables were empirically correlated with snowmelt runoff efficiencies to identify the factors affecting efficiencies both within and among snowmelt-runoff seasons. Inventory-prediction equations were also formulated for use in the stratification of high water-yielding watershed source areas.
W75-11049

MOISTURE AND ENERGY CONDITIONS IN A DRAINING SOIL MASS,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 2G.
W75-11054

PRESCRIPTIVE ECONOMIC MODELS FOR NONSTRUCTURAL FLOOD CONTROL,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 6F.
W75-11060

CONSOLIDATION AND REHABILITATION OF CANALS IN POUDRE VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
C. F. Lurvey.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 727, $5.75 in paper copy, $2.25 in microfiche. AER 73-74CFL-2, November 1973. 121 p, 20 fig, 15 tab, 9 ref. OWRT B-083-COLO(9). 14-31-0001-3867.

Descriptors: *Irrigation, *Water management(Applied), *Canals, *Colorado, Land resources, Land use, Water balance, Water rights, Rehabilitation, Consolidation, Irrigation canals, Canal linings, Canal seepage, Hydraulic structures, Agriculture, Urbanization, Water distribution(Applied), Water supply, Water shortage, Water transfer.
Identifiers: *Poudre Valley(Col).

The advantages and disadvantages of consolidating certain canals south of Cache la Poudre River were explored. Field investigations were reported regarding the rehabilitation of canals and laterals north of the Cache la Poudre River. The engineering costs and expected water savings of such improvements were explored. The land served by the canals on the south-side of the Cache la Poudre River are rapidly being developed. As land is taken out of production, the irrigation water for that land is sold out of the canal and to the city. This causes a greater percentage of the remaining water in the canal to be lost to seepage. The only feasible canal consolidation proposal for the south-side canals is to consolidate all four canals into the Pleasant Valley and Lake Canal. The only feasible canal lining program would appear to be the high seepage loss sections in the North Poudre Canal and Larimer County Canal. Lining the entire length of the North Poudre Canal would alleviate present water shortages in that system except for a few dry years. (Sims-ISWS)
W75-11061

COMPARISON OF UREDO EICHHORNIAE, THE WATERHYACINTH RUST, AND UROMYCES PONTEDERIAE,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W75-11092

STUDIES ON THE RELATIONSHIP BETWEEN DRY-MATTER PRODUCTION AND THE DEVELOPMENT OF A PINE FOREST ON COASTAL SAND DUNES (1), (IN JAPANESE),
Tottori Univ. (Japan). Dept. of Forestry Management.
R. Ogasawara, M. Hikichi, K. Tsuboi, S. Kinoshita, and Z. Shibayama.
Sand Dune Research Institute, Bulletin No 14, p 25-32, March 1975 4 fig, 4 tab, 14 ref. English summary.

Descriptors: *Trees, *Pine trees, *Sands, *Dunes, *Growth rates, Mass, Dimensions, Size, Biomass, Height, Weight, Nitrogen, Phosphorus, Chlorophyll, Carbohydrates, Moisture content, Leaves.
Identifiers: *Japan, Basal area, Stems, Auxins.

Basal area at breast height of pine trees increases with increasing tree height. Total mass and total increment of trees, as well as the ratio of stem biomass and increment, increased with tree height increase. Net assimilation rate tended to increase with increase in tree height, while leaf weight ratio tended to decrease. Total nitrogen, phosphorus, chlorophyll, and water contents increased while auxins, total carbohydrate, and carbohydrate to nitrogen ratio decreased with increasing tree height. Number of fallen leaves on the ground, as well as the total nitrogen, total phosphorus, and water contents of the fallen leaves, increased with increasing tree height. (Frondorf-Arizona)
W75-11098

IMPROVING PRODUCTIVITY IN LOW RAINFALL AREAS, IN INDIA.
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 3F.
W75-11099

COULD THE SEA BE USED TO STORE WATER FOR SUPPLY.--A POSSIBLE SCHEME,
G. H. Mortimer.
Water Services, Vol 29, No 949, p 98-103, March 1975. 6 fig, 1 tab, 5 ref.

Descriptors: *Reservoirs, *Reservoir sites, *Water storage, Reservoir storage, *Water supply, Storage capacity, Routing, Dependable supply.
Identifiers: *Underseas water storage.

Due to the objections of an environmentally conscious public to the construction of large inland water reservoirs, a water storage scheme is proposed which may resolve this problem and could also make more efficient use of the rivers as sources of water supply. This system involves taking water from a river above the tidal limit and pumping it to a flow balancing tank located on the coast. Two pipes are connected into this tank, one carrying water to a supply and the other leading to the flexible bags situated on the seabed a few miles offshore. The works have been divided into three parts: works at the river abstraction point (including the initial water treatment); the flow balancing tank; and, the bags. The advantages of an underseas storage scheme include: since no countryside is lost through flooding, undersea storage should be more readily acceptable to the general public; it allows a more efficient use of rivers as sources of water supply than at present; some degree of economic flexibility is inherent since by adding more bags to the system the yield can be increased to meet demand; and there are a large number of possible sites around the coastline of Great Britain conveniently close to cities such as Teesside, Newcastle, London, and Hull. The main disadvantage is that underwater storage has a greater chance of an accident occurring which will cause a failure of supply than does inland storage. (Orr-FIRL)
W75-11129

LAND AND WATER RESOURCES SURVEY IN THE JEBEL MARRA AREA, THE SUDAN.
Food and Agriculture Organization of the United Nations, Rome (Italy).
Final Report FAO/SF:48/SUD-17, 1968. 72 p, 14 fig, 15 tab, 7 maps, 5 append.

Descriptors: *Land resources, *Water resources, *Surveys, *Maps, Population, Geology, Soil surveys, Land classification, Vegetation, Land use, Water resources development, Agriculture, Forestry, Communication, Railroads, Road construction, Industries, Economics.
Identifiers: *Jebel Marra Area(Sudan), *Sudan.

This report described the first phase of a project under the United Nations Development Programme to assist the Government of the Sudan to obtain technical data on which to base plans for the agricultural development of the Jebel Marra and Wadi Azum areas of the Darfur province. The Government's policy is to broaden the basis of the national economy by geographical dispersal of development activities and crop diversification in agricultural areas. Field operations were carried out from 1963 to 1967. An inventory of basic land and water resources was made and economic studies were carried out. The scope of the introducing more advanced agricultural techniques was examined, together with the social and economic factors involved. The foundation for a follow-up project to support experimental agricultural development was laid. It was recommended that the project be continued with a shift in emphasis from a survey of resources to agricultural development demonstration. The main emphasis should be placed on the production of high gross-value crops which are particularly adapted to the climate and soils of the project area, and which either have to be imported or are only seasonally available. The theme of the report would be extension work among the farmers, to introduce better cultural practices and varieties of crops, and the use of fertilizers and irrigation water. Since pumping from the underground waters of the terrace lands of the Wadi Azum provides the major irrigation possibilities, increased attention should be given to pilot stations and farmer demonstrations of irrigated crops there. (Sims-ISWS)
W75-11139

HYDROLOGIC INVESTIGATION AND DESIGN OF URBAN STORMWATER DRAINAGE SYSTEMS,
Snowy Mountains Engineering Corp., Canberra (Australia).
A. P. Aitken.
Australian Water Resources Council Technical Paper No 10, Vol 1, 1975. 140 p, 14 fig, 17 tab, 63 ref, 4 append.

Descriptors: *Urban hydrology, *Urban drainage, *Australia, *Rainfall-runoff relationships, *Mathematical models, *Simulation analysis, Urban runoff, Rational formula, Drainage systems, Hydrographs, Hydrologic data, Hydrology, Routing, Storm runoff, Hydraulic systems, Storm drains, Design, Water quality.
Identifiers: Rainfall-runoff data, Model evaluation, Drainage design techniques.

A comprehensive report dealt with urban hydrology in Australia. Existing sources of urban rainfall-runoff data in Australia were examined in considerable detail. Specific basins were examined and the kinds of available data were discussed. The Rational Method, the Road Research Laboratory Method, the Modified Road Research Laboratory Method, and Laurenson's Runoff Routing Model were described and evaluated. An earlier evaluation of 8 other mathematical simulation models was summarized and these models compared. Consideration was given to water quality aspects of urban drainage and the types of quality data available. (Terstriep-ISWS)
W75-11141

EFFECTS OF ENTRANCE LOSS ON HARBOR OSCILLATIONS,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
For primary bibliographic entry see Field 8B.
W75-11147

THE DESIGN OF STORM WATER DRAINAGE CHANNELS USING MATHEMATICAL MODEL TECHNIQUES,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 8B.
W75-11150

A STUDY OF FACTORS CONTROLLING THE CHEMICAL QUALITY OF WATER IN CARTWRIGHT CREEK BASIN, WILLIAMSON COUNTY, TENNESSEE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W75-11164

COMPUTER SYSTEMS AND WATER RESOURCES,
Polytechnic Institute of New York, Brooklyn; and Illinois Univ., Chicago.
For primary bibliographic entry see Field 6A.
W75-11174

IMPROVED DESIGN OF DISTRIBUTION NETWORKS BY MINIMUM ROUTE,
Nihon Suido Consultants Co., Tokyo (Japan).
S. Nakajima.
Journal of the American Water Works Association, Vol 67, No 7, p 390-395, July 1975. 6 fig, 3 tab, 9 equ, 9 ref.

Descriptors: *Water distribution(Applied), *Networks, *Design, *Alternative planning, *Pipes, Construction costs, Size, Head loss, Flow, Pressure, Methodology, Operations research, Computers, Junctions, Economics, Equations, Hydraulics, Hydraulic gradient, Optimization, Distribution systems.
Identifiers: *Minimum-route method, Least-cost, Pipe diameter, Connecting pipe, Transportation theory, Branched pattern, Gridiron pattern.

When designing a workable water-distribution network, three conditions should be considered: water-pressure distribution, flow distribution, and engineering economy. Any attempt to improve the design of a network primarily constitutes determining the pipe diameters that minimize total network construction cost while meeting hydraulic requirements. Described is a simple procedure to design an improved water-distribution network using market-ready pipe, applying minimum-route network-planning techniques. Considered is a network of fixed pipe routes, as a pipe network is governed mainly by the network of streets. An improved network is assumed whereby the allowable minimum hydraulic head is maintained at all outlets while minimizing construction costs of the network. Minimum routes to all outlets are selected and designed for market-ready pipe sizes that satisfy the theoretical, economical hydraulic gradient. An example network of a city is simplified to eliminate junctions for which the number of pipes entering the junction is fewer than three. For a basic branching system, use of the minimum route technique produces an economical pipe diameter of standard market size on the basis of most economical theoretical hydraulic gradient along each minimum route. Piping cost is 18.7% less using this method than with conventional method. (Bell-Cornell)
W75-11175

AN IMPLICIT APPROACH TO PRICING AGRICULTURAL WATER TRANSFERS TO URBAN USES,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
W. R. Walker, and G. V. Skogerboe.
Water Resources Bulletin, Vol 11, No 4, p 751-758, August 1975. 6 fig, 6 ref.

Descriptors: *Agriculture, *Water transfer, *Pricing, Urbanization, Optimization, Alternative costs, Water quality, Standards, Management, Algorithms, Water supply, Water distribution(Applied), Waste water treatment, Mathematical models, Systems analysis, Water values.
Identifiers: *Nonlinear programming, *Urban water systems, *Urban water use.

The increased agricultural efficiency of the American farmer has been a substantial impetus to the nation's rapid urbanization. In many western regions where total water supplies are limited, urbanization has required the transfer of heretofore agricultural water rights to the urban use. A major problem in such transfers has been the value or price of the water. A management level nonlinear programming model of a typical urban water system has been developed to find least-cost water supply, distribution, and wastewater treatment alternatives. The values of agricultural transfers were determined as the cost advantages of increasing allowable reuse levels of urban effluents which imply the use of a downstream right. This procedure is justified by the economic theory of alternative cost. Results for a test application to the Denver, Colorado area indicate values on the order of $1,000 per acre-foot of transferable water depending on effluent water quality restrictions and operational policies. (Bell-Cornell)
W75-11178

DISTRIBUTION-SYSTEM OPERATION ANALYSIS MODEL,
Omaha Metropolitan Utilities District, Nebr. Services Dept.
For primary bibliographic entry see Field 5D.
W75-11180

COMPUTER ANALYSIS OF WATER-DISTRIBUTION SYSTEMS,
Springfield Dept. of Water, Light and Power, Ill.
P. Bonansinga.
Journal American Water Works Association, Vol 67, No 7, p 347-350, July 1975. 4 fig.

Descriptors: *Water distribution(Applied), *Computer programs, Flow, Costs, Networks, Pumps, *Computers, Data collections, Design, Optimization, Mathematical models, Systems analysis, Distribution systems.
Identifiers: Flow chart, Hardy Cross method.

Utilizing its speed, a properly programmed computer can solve mathematical models and equations with a higher degree of accuracy than noncomputerized methods, making the digital computer an effective tool for solving water-distribution flow problems. This is illustrated by comparing the performance of computer analysis and of manual solution by the Hardy Cross method. Besides being more accurate, computer analysis is more economical. Considered are the problems in developing a computer program, i.e., writing a program in-house or purchasing a program, and costs. A flow chart is given showing a distribution-system analytical program operating within a typical data collection system. Auxiliary programs can and should be written by the user. A brief description is given of the following programs: update from distribution system; growth projection; distribution-system data; billing master; and water-system load data. Considered are the computer as a design tool and computer optimization. Computer programs can store tremendous amounts of data and can actually eliminate erroneous data. The computer is ideal for deriving the optimal

design since it can consider many alternatives in a short period of time. A sample program demonstrates use of the computer to evaluate the performance of various system designs. In conclusion, the disadvantages and advantages of computerization are listed. (Bell-Cornell)
W75-11182

ADVANCED TECHNIQUES IN THE MATHEMATICAL MODELING OF WATER-DISTRIBUTION SYSTEMS,
Beck (R. W.) and Associates, Seattle, Wash.
S. M. Alexander, N. L. Glenn, and D. W. Bird.
Journal of the American Water Works Association, Vol 67, No 7, p 343-346, July 1975. 2 fig.

Descriptors: *Water distribution(Applied), *Networks, *Simulation analysis, *Computer programs, *Operations, *Analytical techniques, Control, Decision making, Planning, Design, Hazen-Williams equation, Hydraulics, Reservoirs, Management, Mathematical models, Systems analysis, Distribution systems.
Identifiers: Physical data, Operational data, Hardy Cross method, Booster pumps, Source pumps.

Described is a network analysis program which is a state-of-the-art tool for the planning and design of water-distribution systems. Entire systems, regardless of size and complexity, can be modeled. The general-purpose program considered herein incorporates all the features found in a modern water-distribution system and accurately simulates the operation of each component. It provides a complete package that can be used as the basis for major decisions regarding existing system operation, future system development, and operational control. Discussed is computer application of mathematical modeling to water-distribution systems, which can lead to improved system operation. Modeling uses, such as evaluating capabilities of an existing system under anticipated water demands, are listed. Considered are the physical and operational system characteristics. Newton's direct method and the Hardy Cross iterative technique are evaluated. The general-purpose network analysis program uses the Hardy Cross method for computing the head losses and flows and the Hazen-Williams formula for describing the head loss versus flow relationship. Discussed are water system features (i.e., source pumps), initial flows, pressure, and hydraulic grade line, analytical and graphical output, updating of data, economic analysis, diagnostics, and program application. (Bell-Cornell)
W75-11183

MACROSCOPIC DISTRIBUTION-SYSTEM MODELING,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
R. DeMoyer, Jr., and L. B. Horwitz.
Journal of the American Water Works Association, Vol 67, No 7, p 377-380, July 1975. 3 fig, 3 tab, 17 equ, 9 ref.

Descriptors: *Water distribution(Applied), *Control, Networks, Mathematical models, Statistical models, Hydraulics, Regression analysis, Pumps, Pipes, Flow, Simulation analysis, Design, Algorithms, Equations, Operations research, Management, Model studies, Distribution systems.
Identifiers: Macroscopic model, Operating data, Tanks, Head drop.

Presented is a derivation of a regression algorithm developed previously by Gilman et al as an alternative to conventional means for modeling water-distribution systems. The statistical model developed herein is macroscopic, as it deals only with major heads and flows associated with pumps and tanks. Given are the drawbacks of using a microscopic, or full network, model for purposes of control. The macroscopic model, designed to overcome these limitations, has great speed of solution and accuracy and is kept very up-to-date; it obtains its parameters from continual analysis of operating data, obtains the major heads and flows by a noniterative process, and functions without takeoff assumptions. The model has been developed for a system having only partial information available because of the stochastic nature of customer demand and the constant change in hydraulic network characteristics. The validation procedure shows that the macroscopic model is able to reproduce actual operating data accurately in a two-pump station, two-tank distribution system. It is found to be the exact equivalent of a full network model subjected to proportional loads in a day-long simulation. However, since the accuracy of the macroscopic model will decrease in a district having large nonproportional industrial loads, a full network model should replicate such a district better. (Bell-Cornell)
W75-11185

FINITE-ELEMENT METHOD FOR WATER-DISTRIBUTION NETWORKS,
ACI Environics, Melbourne (Australia).
A. G. Collins, and R. L. Johnson.
Journal of the American Water Works Association, Vol 67, No 7, p 385-389, July 1975. 5 fig, 34 equ, 14 ref.

Descriptors: *Water distribution(Applied), *Networks, *Finite element analysis, *Pipes, Equations, Algorithms, Numerical analysis, Structural analysis, Pipe flow, Head loss, Hydraulics, Computer programs, Temperature, Effects, Hazen-Williams equation, Systems analysis, Methodology, *Distribution systems.
Identifiers: Hardy Cross method.

The finite-element method has been increasingly used in a variety of engineering fields, including structural analysis. The equivalence of structural systems and pipe networks has long been recognized. The specific pipe-network problem may be defined using the finite-element approach, but since the system of equations for structural problems is normally linear, actual solution is difficult due to the nonlinear constitutive equations relating the flow and head loss. Herein, a computational algorithm derives the unique solution for an easily solved linear system equivalent to the true nonlinear system for pipe networks. The successful application of the finite-element method to pipe-network problems shows that the method is not only superior to conventional Hardy Cross techniques, but that further advantages of complete network representation, simplified input data, and unlimited network size can be obtained. The major advantage of the method is its speed of convergence and lack of convergence problems. The program developed allows for solution by either the Hazen-Williams or the Darcy-Weisbach flow-head-loss relationships, and it can consider the effect of temperature variations on head loss throughout the network. GENFEM, a general, very efficient finite-element program, is easily adapted for the pipe-network problem. The mathematical basis and applications of this methodology are described in detail to allow easy adaptation of other finite-element programs for solving water-distribution--network problems. (Bell-Cornell)
W75-11186

OPERATION CLEAN SWEEP,
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 5G.
W75-11192

FIELD TESTS OF SLOW-RELEASE HERBICIDES,
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 5G.
W75-11193

AQUATIC PLANT CONTROL ON LAKE CORPUS CHRISTI,
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 5G.
W75-11194

AQUATIC PLANT RESEARCH AND CONTROL IN FLORIDA,
Florida Dept. of Natural Resources, Tallahassee.
J. C. Hudson.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 25-27, August 1974.

Descriptors: *Aquatic weed control, *Research and development, *Florida, Financing, State governments, Participating funds, Water hyacinth.
Identifiers: Elodea, Water milfoil.

The Florida Department of Natural Resources is responsible for coordinating research and control of noxious aquatic plants at an annual expenditure of $2.8 million. Water hyacinth, Florida elodea, and Eurasian water milfoil are the most important, with elodea the major pest. Research efforts involve biological, chemical, and mechanical control methods, such as foreign exploration and introduction of insects and pathogens, botanical and ecological aspects of control, integrated chemical and biological techniques, utilization studies, ditchbank grass control, analysis of herbicides, and literature reviews. Results with mechanical harvesters to control water hyacinths in St. Johns River have not been encouraging. Use of white amur in conjunction with herbicides; establishment and effectiveness of the water hyacinth weevil; and use of foams, inverts, slow-release formulations, and new herbicides are being studied. Increased effectiveness and efficiency are needed, while decreasing drift and herbicide concentration. Airboats and an aircraft with a microfoil boom treated 35,000 acres during 1972-1973. Botanists help establish aquatic plant control programs, update control procedures, and monitor the Aquatic Plant Control Permit System. Training sessions for applicators were planned and new regulations on importation, cultivation, and transportation implemented. Matching state funds are available to local agencies for aquatic plant control. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11195

CRITERIA FOR HERBICIDE EVALUATION,
Environmental Protection Agency, Washington, D.C. Office of Pesticide Programs.
For primary bibliographic entry see Field 5G.
W75-11196

REGISTRATION OF HERBICIDES FOR AQUATIC USE,
Environmental Protection Agency, Washington, D.C. Office of Pesticide Programs.
For primary bibliographic entry see Field 5G.
W75-11197

DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED FOR WATER MILFOIL CONTROL IN LARGE RESERVOIRS,
Tennessee Valley Authority, Muscle Shoals, Ala.
For primary bibliographic entry see Field 5B.
W75-11198

CHEMICAL CONTROL OF EGERIA DENSA,
Agricultural Research Service, Fort Lauderdale, Fla.
For primary bibliographic entry see Field 5G.
W75-11199

FIELD TESTING OF AQUATIC HERBICIDES FOR CONTROL OF EGERIA DENSA,
University of Southwestern Louisiana, Lafayette. Dept. of Plant Industry.
For primary bibliographic entry see Field 5G.
W75-11200

AQUATIC PLANT CONTROL USING HERBICIDES IN A LARGE POTABLE WATER SUPPLY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
For primary bibliographic entry see Field 5G.
W75-11201

BIOLOGICAL CONTROL OF ALLIGATOR WEED, 1959-1972,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 5G.
W75-11202

BIOLOGICAL CONTROL OF EURASIAN WATER MILFOIL,
Agricultural Research Service, Gainesville, Fla. Biological Control Lab.
N. R. Spencer.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 75-83, August 1974. 1 tab, 8 ref.

Descriptors: *Biocontrol, *Aquatic weed control, Plant ecology, Plant growth, Life cycles, Distribution, Foreign research, Insects, Hosts.
Identifiers: *Eurasian water milfoil, Lepidoptera, Coleoptera, Homoptera, Parapoynx stratiotata, Litodactylus leucogaster.

Eurasian water milfoil, an introduced perennial submersed weed, has reached pest proportions by infesting thousands of acres in Chesapeake Bay, in Tennessee reservoirs, and in Florida and Georgia lakes and river basins by restricting water usage and decreasing property values. It grows under a wide range of conditions and forms a smothering blanket that crowds out other vegetation. Its ecology, growth habits, and life cycle are reviewed. Studies in the United States, Yugoslavia, and Pakistan have uncovered a number of biotic agents that show potential for controlling this plant. Twelve Lepidoptera, ten Coleoptera, one Diptera, and three Homoptera have been associated with Eurasian water milfoil. Many of the species are polyphytophagous and cannot be imported into the United States, but the associations demonstrate that the weed is a suitable host for insects belonging to several orders. At present control in the United States is limited to the use of herbicides and some cultural methods such as water management. One insect species, Parapoynx stratiotata, shows a potential for reducing vegetative reproduction. Litodactylus leucogaster may reduce seed production. Further testing under United States quarantine will be needed to determine which species could be imported for release in North America. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11203

INTEGRATED CONTROLS ON NOXIOUS AQUATIC PLANTS,
Texas Parks and Wildlife Dept., San Antonio. Statewide Noxious Vegetation Control Program.
For primary bibliographic entry see Field 5G.
W75-11204

UTILIZATION OF PHYTOPATHOGENS AS BIOCONTROLS FOR AQUATIC WEEDS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W75-11206

TRANSPLANTING SEA GRASS IN MISSISSIPPI SOUND,
Gulf Coast Research Lab., Ocean Springs, Miss.
L. N. Eleuterius.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 103-106, August 1974.

Descriptors: *Marine plants, *Submerged plants, *Grasses, *Planting management, Spoil banks, Silting, Salinity, Mississippi, Bottom sediments, Estuaries, Slopes, Methodology, Turbidity.
Identifiers: *Sea grass, *Transplantation, Diplanthera wrightii.

The establishment of submerged plants by transplantation on spoil or other barren bottom areas in marine or estuarine systems is described. Effective anchors to moor the transplants covered with 20 feet or more of water were devised. Transplanting to barren bottom areas was possible within limits. The 'best' species, based on survival and extremely rapid growth, was Diplanthera wrightii. No appreciable differences in nutrient levels between vegetated and barren areas existed. Successful transplants were made in early spring and summer following mild winter temperatures or in summer following a severe winter, but low winter temperatures killed fall and winter transplants. Prolonged exposure to low salinity (5 parts per thousand or less) was detrimental. Sedimentation rates exceeding three inches per month also caused death. Spoil banks with steep slopes and spill areas where the substratum was being constantly reworked were unsuitable for transplantation due to erosive forces of waves and currents. Highly turbid water in near-shore areas also restricted plant growth. Sometimes eroded emergent spoil covered submerged spoil and killed the transplants. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11207

AQUATIC WEED FIELD TEST PROGRAM USING A CO2 ELECTRIC DISCHARGE CONVECTION LASER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5A.
W75-11208

CO2 LASER EFFECTS ON WATER HYACINTH,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5G.
W75-11209

OPERATIONS PLATFORMS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. O. Benn.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 119-127, August 1974. 7 fig.

Descriptors: *Transportation, *Application equipment, *Aquatic weed control, Application methods, Spraying, Barges, Boats, Irradiation.
Identifiers: Laser transport, Archimedes' screw vehicles, Riverine utility craft, Screw propulsion vehicles.

High-mobility operations platforms for herbicide sprayings and laser irradiation of aquatic weeds must be able to move freely in weed-infested waterways with reasonable speeds, have good control, be usable in unfavorable weather, be reliable, economical, and be readily transportable over normal roads between sites. A vehicle running on buoyant Archimedes' screws may be the most suitable. Compared to boats and wheeled and tracked vehicles, the two screw vehicles (the marsh screw and the Riverine Utility craft) run well in water, better in marsh areas, but poorly on firm soil. The marsh screw is more suitable for spray application than the Riverine Utility craft. Screw vehicles are one to ten times more effective than small boats or barges used as support vehicles for herbicide applications with comparatively little added cost. The laser system is too heavy for the present equipment, except barges, but the screw propulsion principle would be useful for the application of herbicide sprays and biological control organisms in inaccessible areas and as an ancillary vehicle for mechanical treatments. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11210

HERBICIDE CHEMICALS AND THEIR EFFECT ON THE AQUATIC ENVIRONMENT,
Bureau of Sport Fisheries and Wildlife, Washington, D.C. Div. of Fishery Research.
For primary bibliographic entry see Field 5C.
W75-11211

REGISTRATION OF AQUATIC HERBICIDES,
Office of the Chief of Engineers (Army), Washington, D.C.
E. O. Gangstad, P. A. Frank, C. R. Walker, and J. R. Knoll.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p D3-D31, August 1974. 33 ref.

Descriptors: *Aquatic weed control, *Methodology, Herbicides, Biocontrol, Chemcontrol, Algal control, Grasses, Floating plants, Submerged plants, Canals, Irrigation ditches, Mechanical control, Harvesting, Vegetation, Rates of application, Application methods.
Identifiers: Emersed weeds, Broadleaved plants.

Registration of aquatic herbicides is imperative for their use in vegetation management. Forms of obnoxious aquatic vegetation can be algae or vascular aquatic plants such as floating, submersed, emersed, and marginal plants. Agriculture, recreation, property values, wildlife and fisheries management, potable water supplies, and navigation are affected by aquatic vegetation. Copper sulfate, dichlone, dichlobenil, acrolein, aromatic solvent, diquat, and endothall are used to manage algae; and 2,4-D, silvex, and diquat control floating weeds. To control submersed weeds, acrolein, aromatic solvent, copper sulfate, diquat, endothall, monuron or diuron can be used in irrigation canals and ditches; acrolein, aromatic solvent, and copper sulfate in drainage ditches; and dichlobenil, diquat, endothall, fenac, 2,4-D, silvex, and sometimes acrolein, aromatic solvent, simazine, and diuron can be applied in lakes, ponds, and reservoirs. Emersed and marginal weeds can be treated with 2,4-D or silvex and grass and grasslike species with dalapon, 2,4-D, or monosodium methanearsenate and trichloroacetic acid. Mechanical control devices, biocontrols (such as fish, snails, crayfish, insects, pathogens, and competitive vegetation), and ecological modifications can be used. The advantages and disadvantages of chemical methods are discussed. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11212

DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED TO THE WATERSHED,
Oregon State Univ., Corvallis. School of Forestry.
For primary bibliographic entry see Field 5B.
W75-11213

DISSIPATION OF PHENOXY HERBICIDES APPLIED TO RIPARIAN VEGETATION,
Pennsylvania State Univ., University Park. School of Forestry.
For primary bibliographic entry see Field 5B.
W75-11214

WATER HYACINTH RESEARCH IN PUERTO RICO,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5G.
W75-11215

WATER LEVEL MANIPULATION: A TOOL FOR AQUATIC WEED CONTROL,
Louisiana Wild Life and Fisheries Commission, Tioga. Aquatic Weed Research.
L. V. Richardson.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p F25-F30, August 1974.

Descriptors: *Aquatic weed control, *Water level fluctuations, *Reservoirs, Rooted aquatic plants, Alligatorweed, Water hyacinth, *Louisiana, Submerged plants, Overflow, Skimming, Floating plants, Drawdown, Forages, Deer, Fisheries, Drying, Freezing.
Identifiers: Duckweed, Bayou DeSiard(La), Lac a nardia(La).

Louisiana has a severe submergent/emergent aquatic weed problem in 35 of its 40 reservoirs. Water level manipulation can improve water quality, improve fisheries, and control aquatic weeds. In Bayou DeSiard, a top laminar flow skimmed duckweed from the surface. During an overflow in Lac a nardia, boats pushed alligatorweed mats into fields where they dried when the water level was lowered. Some alligatorweed became terrestrial and was effectively browsed by deer. Drying and freezing during drawdown can control water hyacinths. However first and second year drawdowns can increase hyacinth infestations, since its seeds need to dry for germination. Fall-winter drawdowns give the best broad-range control of floating emergent and submergent plants but timing should be determined by the target plant. The best time to stress plants is after the roots have utilized their stored energy and before the plant restores energy to its roots. A 40-70% reduction in surface acreage with 3/4 inch water being removed each 24 hours is recommended. Time and method of water return into the basin must be considered. Dissolved oxygen must be monitored to avoid fish kill. Encroachment of undesirable plants must be checked and the public informed of plans. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11216

THE AQUATIC WEED PROBLEM. 1. IDENTIFICATION,
Victoria State Coll., Carlton (Australia). Dept. of Plant Physiology.
For primary bibliographic entry see Field 2I.
W75-11220

ALGAE IN BALTIMORE'S RESERVOIRS,
Baltimore City Dept. of Public Works, Md. Water Supply Treatment and Pumping Div.
For primary bibliographic entry see Field 5C.
W75-11221

A PRACTICAL WAY TO FIND MINIMUM DRAINAGE AREA FOR A WELL,
Gruy (H. J.) and Associates, Inc., Dallas, Tex.
For primary bibliographic entry see Field 4B.
W75-11290

GENERATION OF ARID ZONE RAINFALL AND RUNOFF,
University of New England, Armidale (Australia). School of Natural Resources.
For primary bibliographic entry see Field 2A.
W75-11303

SOME OBSERVATIONS ON RAINFALL IN WESTERN NEW SOUTH WALES,
New South Wales Univ., Kensington (Australia). School of Wool and Pastoral Sciences.
For primary bibliographic entry see Field 2B.
W75-11304

DROUGHTS, DISTRIBUTIONS AND DEPENDENCE: AN ANALYSIS OF SOME SYNTHETIC DATA GENERATION METHODS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11305

VARIABILITY, PERSISTENCE AND YIELD OF AUSTRALIAN STREAMS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11308

GUIDELINES FOR THE IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS IN THE CONSTRUCTION AND OPERATION OF A RESERVOIR,
Illinois Univ., Urbana. Dept. of Forestry.
For primary bibliographic entry see Field 5C.
W75-11316

4B. Groundwater Management

HYDROGEOLOGY AND WATER RESOURCES OF MIDDLE KIRKLAND CREEK BASIN, YAVAPAI COUNTY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
J. H. Randall.
Arizona University, Tucson, Department of Hydrology and Water Resources. MS Thesis, 1974. 57 p, 10 fig, 6 tab, append, 22 ref.

Descriptors: *Hydrogeology, *Aquifers, *Aquifer characteristics, *Sediments, *Basalts, *Alluvial aquifiers, *Arizona, Groundwater, Structural geology, Alluvium, Soil types, Conglomerate rocks, Water yield, Zone of saturation, Flood plains, Soil mechanics.
Identifiers: *Kirkland Creek(Ariz), *Yavapai County(Ariz).

Middle Kirkland Creek basin lies at the northern edge of the basin and range province 20 miles southwest of Prescott, Arizona. The hydrogeologic system of the basin includes two major aquifers, alluvial sediments and basaltic volcanics. The alluvial sediments are a series of granitic pebble conglomerates intercalated with basalt flows in some areas overlaid by fine-grained lacustrine sediments that grade laterally into a pebble conglomerate. Overlying this unit is a thin narrow deposit of unconsolidated sands, gravels, and silts representing the flood-plain alluvium. The basalt aquifer consists of a series of more than 1000 feet of fractured basalt flows interbedded with cinder and conglomeratic layers. The water production potential of the basaltic units in the central portion of the basin is unknown. However, the survey indicates that the hydrogeologic system allows a thick zone of saturation storing large quantities of water. Wells drilled in the Kirkland gorge could have an estimated yield of 200 to 1000 gpm. (McLacklan-Arizona)
W75-10872

COMPUTER ALGORITHMS USEFUL FOR DETERMINING A SUBSURFACE ELECTRICAL PROFILE VIA HIGH FREQUENCY PROBING,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 8G.
W75-10910

DETERMINATION OF REGIONAL HYDRAULIC CONDUCTIVITY THROUGH USE OF C-14 DATING OF GROUNDWATER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-10930

QUALITY OF WATER IN AQUIFERS OF THE AMARGOSA DESERT AND VICINITY, NEVADA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W75-10932

REVIEW OF CONFERENCE ON HYDROLOGY OF DEEP SEDIMENTARY BASINS,
Tulsa Univ., Okla. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W75-10935

THE MINOR AND TRACE ELEMENTS, GAS, AND ISOTOPE COMPOSITIONS OF THE PRINCIPAL HOT SPRINGS OF NEVADA AND OREGON,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W75-10937

ESTIMATED AVAILABILITY OF SURFACE AND GROUND WATER IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W75-10938

GROUND WATER IN THE CORVALLIS-ALBANY AREA, CENTRAL WILLAMETTE VALLEY, OREGON,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-10940

RECHARGE AREAS OF THE FLORIDAN AQUIFER IN SEMINOLE COUNTY AND VICINITY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-10944

HORIZONTAL GROUNDWATER COLLECTORS, HYDRAULICS AND DESIGN,
International Water Supply Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 8B.
W75-10998

HORIZONTAL GROUNDWATER COLLECTORS, 'CANADA'S LARGEST WATER WELL',
Prince George City Engineer's Office (British Columbia).
For primary bibliographic entry see Field 8B.
W75-10999

ILLINOIS LANDFILL LAW MAY EFFECT NEARBY STATES.
For primary bibliographic entry see Field 5B.
W75-11011

HOW SILICA AFFECTS IRON REMOVAL FROM GROUNDWATER,
Yule, Jordan and Associates, Camp Hill, Pa. Environmental Engineering Div.
For primary bibliographic entry see Field 5F.
W75-11016

STUDY OF CRITERIA AND MODELS ESTABLISHING OPTIMUM LEVEL OF HYDROGEOLOGIC INFORMATION FOR GROUNDWATER BASIN MANAGEMENT,
Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2F.
W75-11042

MANAGEMENT OF RETARDATION OF SALT WATER INTRUSION IN COASTAL AQUIFERS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W75-11058

ENDEMIC NEPHROPHATHY AND ITS RELATION TO THE CONTAMINATION OF WELL WATER BY PHENOLIC COMPOUNDS IN BARSA-ARAD (NEFROPATIA ENDEMICA SI RELATIA CU IMPURIFICAREA PRIN COMPOUSI FENOLICI IN APELE FINTINILOR DIN COMUNA BARSA-ARAD),
For primary bibliographic entry see Field 5B.
W75-11105

DEPRIVATION CONTRIBUTION AND INTERFERENCE EFFECTS OF MULTIPLE WELLS IN A COMMON AQUIFER,
Oklahoma Univ., Norman. Dept. of Civil Engineering and Environmental Science.
J. F. Harp, and J. G. Laguros.
Ground Water, Vol 13, No 3, p 251-253, May-June 1975. 1 fig, 1 tab.

Descriptors: *Groundwater, *Aquifers, *Management, *Groundwater mining, *Pumping, Overdraft, Water wells, Groundwater resources, Water supply, Drawdown, Water table, Distance, Equilibrium.
Identifiers: *Depleted aquifer, *Interference effects, *Depletion effects, Multiple wells, Deprivation.

A method of assessing groundwater interference effects of multiple wells upon any given well in an aquifer was presented. The method specifically related to depleted aquifers and attempted to assign the responsibility for the depletion effects to all users on a reliable basis. This basis entails the fundamental relationships between the pertinent variables and is not a simple percentage of water usage rates. The method took into account both flow magnitude and radial distances from all users to the given depleted account both flow magnitude and radial distances from all users to the given depleted well. Large flows at longer distances, in general, affected a given well less than smaller flows at closer distances. The methodology applied was developed as a result of a legal suit where relative responsibility among several users for depletion effects had to be assigned. The method assigned the effects, or deprivation contribution, of all water users on any given well in an aquifer common to all the wells. The limitations of the method were also discussed. (Sanderson-ISWS)
W75-11142

URANIUM MINERALIZATION BY GROUND WATER IN SEDIMENTARY ROCKS, JAPAN.
Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan). Raw Materials Div.
For primary bibliographic entry see Field 2F.
W75-11145

A STUDY OF FACTORS CONTROLLING THE CHEMICAL QUALITY OF WATER IN CARTWRIGHT CREEK BASIN, WILLIAMSON COUNTY, TENNESSEE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W75-11164

SOLID WASTES, ANIMAL REFUSE, AND ORGANIC RESIDUES DISPOSAL, AND THE QUALITY OF GROUND WATER,
Tuskegee Inst., Ala. School of Applied Sciences.
For primary bibliographic entry see Field 5B.
W75-11244

APPROXIMATION FOR STEADY INTERFACE BENEATH A WELL PUMPING FRESH WATER OVERLYING SALT WATER,
New Mexico Inst. of Mining and Technology, Socorro.
R. G. Haubold.
Ground Water, Vol 13, No 3, p 254-259, May-June, 1975. 3 fig, 1 tab, 12 ref.

Descriptors: *Saline water intrusion, *Saline water-fresh water interfaces, *Mathematical models, *Estimating equation, Percolation, Seepage, Interfaces.
Identifiers: *Hele-Shaw model, *Muskat flow through porous media.

The computation of the shape of the interface between fresh water pumped from a well and the salt water beneath it was based on an empirically derived modification of Muskat's approximation for the height of the cone beneath a well. Differing depths of well penetrations and their effect on the upconed interface were investigated with the approximation. The computed interfaces (actually transition zones) were compared with corresponding interfaces determined experimentally in a Hele-Shaw model. Alteration of the length of the production zone of a well at a constant pumping rate did not influence the shape or position of the interface significantly. Though the approximation fits closely with the model, it should be refined further. (Bradbeer-NWWA)
W75-11255

COLORADO CITY SOLVES ITS SAND PUMPING PROBLEMS,
Wright Water Engineers, Inc., Denver, Colo.
For primary bibliographic entry see Field 8C.
W75-11261

GROUND WATER DEPLETION AND SUBSIDENCE PROBLEMS IN TAIPEI BASIN,
National Taiwan Univ., Taipei. Hydraulic Lab.
C. Wu.
In: International Symposium on Development of Ground Water, November 26-29, 1973, Madras, India, Vol 1, p IIB 17-28 (1973). 9 fig, 1 tab, 3 ref.

Descriptors: *Land subsidence, *Groundwater, *Artesian aquifers, *Clays, Fluid withdrawal, Potentiometric level, Compressibility, Head loss, Instrumentation.
Identifiers: Clay stringers, Piezometric decline, *Taiwan(Taipei basin).

Releveling of bench marks in 1971 and 1973 indicates that land subsidence of the ground surface in the Taipei Basin has exceeded 1.8 meters since 1957. In the sharp subsidence area, subsidence which was about 0.6 meters in 1966 has doubled. The maximum rate of subsidence in recent years has been about 25 cm per year. As a result of accelerated urbanization of the Basin area, most of the modern ground water development has occurred since 1957. The annual pumpage was 8.9 million cubic meters, 328 million cubic meters, and 435 million cubic meters for 1957, 1964, and 1969, respectively. As a result of an imposition of strict controls, the extracted water was reduced to 249 million cubic meters in 1972. Plots of subsidence versus decline in artesian pressure suggest that pressure decline is a major cause of the subsidence. Consolidation data are used to verify this relationship. However, other causes such as compaction of soil, tectonic adjustment, and loading at the land surface may have contributed to the subsidence. (Bradbeer-NWWA)
W75-11262

CONOCO TECHNOLOGY CURBS PRODUCTION POLLUTION,
Continental Oil Co., Houston, Tex.
For primary bibliographic entry see Field 5G.
W75-11267

FORMULATION OF BOUNDARY CONDITIONS AT THE SURFACE OF A POROUS MEDIUM,
Alberta Univ., Edmonton.
For primary bibliographic entry see Field 8B.
W75-11269

UNCONVENTIONAL AIR DRILLING REDUCES WELL COSTS.
For primary bibliographic entry see Field 8C.
W75-11270

THE KINETICS OF CRYSTALLIZATION OF SCALE-FORMING MINERALS,
State Univ. of New York, Buffalo.
For primary bibliographic entry see Field 8G.
W75-11273

ANALYSIS OF FACTORS INFLUENCING MOBILITY AND ADSORPTION IN THE FLOW OF POLYMER SOLUTION THROUGH POROUS MEDIA,
Shell Oil Co., Houston, Tex.
For primary bibliographic entry see Field 8B.
W75-11275

HOW STEAM IS PRODUCED AND HANDLED AT THE GEYERS,
R. E. Snyder.
World Oil, Vol 180, No 7, p 43-48, June, 1975. 7 fig, 1 tab, 6 ref.

Descriptors: *Geothermal studies, *Steam, *Energy, *Thermal powerplants, Facilities, Industrial plants, Geology, Groundwater, Production, *California.
Identifiers: *Geothermal energy, Superheated steam, The Geysers.

Development by well clusters around a plant site is necessary when using superheated steam to produce energy. The planning of such developments, based on geology, completed wells and current economics is discussed. The actual plant operation, as well as the payment procedures, is outlined. (Bradbeer-NWWA)
W75-11280

TESTS SHOW POTASSIUM MUD VERSATILITY,
NL Industries, Inc., Houston, Tex. Baroid Div.
For primary bibliographic entry see Field 8G.
W75-11284

HOW TO FIND TRANSITION ZONES IN SOFT FORMATIONS,
Continental Oil Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W75-11285

HOW TO MAKE SQUEEZE CEMENTING SUCCESSFUL,
Rike Service, New Orleans, La.
For primary bibliographic entry see Field 8F.

W75-11286

MAKING LOG ANALYSTS OF GEOLOGISTS.
For primary bibliographic entry see Field 7C.
W75-11288

SUBSURFACE WATER -- TOOL FOR PETROLEUM EXPLORATION,
Mobil Research and Development Corp., Dallas, Tex.
A. G. Ostroff.
Society of Petroleum Engineers Journal, Vol 15, No 1, p 50-64, February, 1975. 7 fig, 2 tab, 92 ref.

Descriptors: *Groundwater, *Water utilization, *Exploration, *Oil industry, *Mining, Water chemistry, Trace elements, Permeability, Faults(Geologic), Dissolved solids, Groundwater movement, Water circulation, Locating, Alternative water use.
Identifiers: Oil exploration.

The close association of hydrocarbon accumulations with subsurface waters has led to the use of properties of these waters as a secondary exploration tool. Both chemical and physical characteristics of subsurface waters have been utilized in the search for petroleum. The movement of subsurface waters has made a significant contribution to the accumulation of petroleum. In addition to dissolved organic and inorganic constituents, hydrodynamic movement, oxidation-reduction potentials, and water classification systems have been advocated for use in petroleum exploration. Water properties have been utilized in locating permeability barriers, faults, geopressured zones, and unconformities. Examples of water as an exploration tool are given. (Bradbeer-NWWA)
W75-11289

A PRACTICAL WAY TO FIND MINIMUM DRAINAGE AREA FOR A WELL,
Gruy (H. J.) and Associates, Inc., Dallas, Tex.
R. K. Prasad.
Oil and Gas Journal, Vol 71, No 31, p 118-120, July 30, 1973. 2 fig, 2 tab, 5 ref.

Descriptors: *Reservoir yield, *Water supply, *Reservoir-storage, *Groundwater, Supply, Mathematics, Equations, Forecasting, Oil, Reservoir(Oil), Oil wells, Aquifers.
Identifiers: Production capacity, Aquifer development.

A new method of calculating the drainage area and the hydrocarbon pore volume assigned to a new well is introduced. It assumes that calculation of the drainage area is dependent on the sensitivity of the pressure gauge, error in chart reading, the background noise in the reservoir, the superposition of drawdown and shutin transients, and the flow rates. An example solution using the new equations is presented. Other applications for the method are given. (Bradbeer-NWWA)
W75-11290

CEMENTING TODAY'S PROBLEM WELLS.
For primary bibliographic entry see Field 8F.
W75-11293

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 4: PITFALLS IN OVERPRESSURE PREDICTION,
Continental Oil Co., Ponca City, Okla. Production Research Dept.
For primary bibliographic entry see Field 8G.
W75-11294

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 5: PREDICTING HYDROCARBON ENVIRONMENTS WITH WIRELINE DATA,
Continental Oil Co., Houston, Tex. Production Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11295

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 6: CORRELATING GEOPRESSURE GRADIENTS WITH HYDROCARBON ACCUMULATIONS,
Continental Oil Co., Houston, Tex. Production Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11296

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 7: THE SHALE RESISTIVITY RATIO - A VALUABLE TOOL FOR MAKING ECONOMIC DRILLING DECISIONS,
Continental Oil Co., Houston, Tex. Production Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11297

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 8: NEEDLESS SPENDING OF DRILLING AND EXPLORATION MONEY CAN BE PREDICTED-AND PREVENTED,
Continental Oil Co., Houston, Tex. Production Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11298

WATER SYSTEM ACCESSORIES,
For primary bibliographic entry see Field 8C.
W75-11299

4C. Effects On Water Of Man's Non-Water Activities

MAN'S INFLUENCE ON THE HYDROLOGICAL CYCLE: A DRAFT REPORT OF THE UNESCO/FAO WORKING GROUP ON THE INTERNATIONAL HYDROLOGICAL DECADE.
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 2A.
W75-10863

BALANCING THE EFFECTS OF MAN'S ACTIONS ON THE HYDROLOGICAL CYCLE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 2A.
W75-10865

IMPACT OF ENERGY DEVELOPMENT ON THE LAW OF THE COLORADO RIVER,
California Univ., Los Angeles. School of Law.
G. D. Weatherford, and G. C. Jacoby.
Natural Resources Journal, Vol 15, P 171-213, January, 1975. 5 fig, 2 tab, 86 ref.

Descriptors: *Water supply, *Water allocation(Policy), *Water law, *Colorado river, *Electric power production, Water management(Applied), Water conservation, Water resources, Water requirements, Water utilization, Natural resources, Water rights, Prior appropriation, Public rights, Water demand, Competing uses, Colorado river basin, Arid lands, Consumptive use, Reasonable use, Fossil fuels.
Identifiers: *Energy development.

Generally, the Colorado river flow is divided among users on the basis of beneficial consumptive use. New societal demands for water along with large economic forces to exploit fossil fuels in the Colorado river basin are causing profound changes in the basin. Claims for greater shares of the flow are being made by Indians, recreationists, environmentalists, supporters of fish and wildlife, and commercial mining interests. The flexibility of the law of the river pertaining to energy development, water demand, and competing forces is discussed. (Robinett-Arizona)
W75-10869

EFFECTS OF PINYON-JUNIPER REMOVAL ON NATURAL RESOURCE PRODUCTS AND USES IN ARIZONA,
Forest Service (USDA), Phoenix, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-10886

STABILIZATION AND RECONSTRUCTION OF TEXAS COASTAL FOREDUNES WITH VEGETATION,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 2L.
W75-10887

REVEGETATING DISTURBED AREAS IN THE SEMIARID SOUTHWEST,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W75-10892

APPROXIMATE ANNUAL WATER BUDGETS OF TWO CHAINED PINYON-JUNIPER SITES,
Utah State Univ., Logan. Watershed Science Unit.
For primary bibliographic entry see Field 4A.
W75-10896

BIOCHROME ANALYSIS AS A METHOD FOR ASSESSING PHYTOPLANKTON DYNAMICS, PHASE II,
Arkansas Univ., Fayetteville. Dept. of Botany and Bacteriology.
For primary bibliographic entry see Field 5C.
W75-11052

WATER POLLUTION FROM NONPOINT SOURCES,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5B.
W75-11158

GROUND WATER DEPLETION AND SUBSIDENCE PROBLEMS IN TAIPEI BASIN,
National Taiwan Univ., Taipei. Hydraulic Lab.
For primary bibliographic entry see Field 4B.
W75-11262

4D. Watershed Protection

SHRUB TRANSPLANTING FOR WATERSHED MANAGEMENT AND RANGE IMPROVEMENT IN IRAN,
Arizona Univ., Tucson. Dept. of Watershed Management.
N. Nemati.
Arizona University, Tucson, Department of Watershed Management, MS Thesis, 1974. 52 p, 21 fig, 4 tab, 18 ref.

Descriptors: *Watershed management, *Erosion control, *Arid climates, *Shrubs, Erosion, Vegetation, Precipitation, Moisture deficit, Revegetation, Humidity, Evaporation, Range management.

Identifiers: *Iran, Atriplex canescens(Fourwing saltbush).

The central plateau of Iran is virtually void of plant growth due to cold winters, hot summers, low precipitation, low atmospheric humidity, and high evaporation. Transplanting shrub species has been shown to be one possible way to revegetate these rangelands. Fourwing saltbush (Atriplex canescens) was the most adaptable of the three saltbushes tested for growth in nurseries in plastic bags and transplanted in the central plateau of Iran. Their adaptability to the harsh climate will help restore the watershed, provide effective erosion control, and generally improve the vegetation. (McLachlan-Arizona)
W75-10870

SEASONAL VARIATIONS IN THE INFILTRATION RATE OF A WHITEHOUSE SOIL IN SOUTHERN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2G.
W75-10873

FACTORS AFFECTING EROSION IN A SEMI-ARID WATERSHED,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 2J.
W75-10884

REVEGETATING DISTURBED AREAS IN THE SEMIARID SOUTHWEST,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
E. F. Aldon.
Journal of Soil and Water Conservation, Vol 28, No 5, p 223-225, September-October, 1973. 6 fig, 13 ref.

Descriptors: *Soil stabilization, *Semiarid climates, *Southwest U.S., *Vegetation establishment, Rehabilitation, Density, Watershed management.
Identifiers: Fourwing saltbush, Alkali sacaton.

The harsh climatic extremes of the semiarid Southwest make it difficult and often impossible to establish plants for soil stabilization. A 20 year watershed rehabilitation project concentrated on the establishment of two plants native to the area - fourwing saltbush (Atriplex canescens (Pursh) Nutt.) and alkali sacaton (Sporobolus airoides (Torr.) Torr.). A step-by-step planting guide is presented for each plant including growing transplants and field planting procedures. Information is also provided to determine those areas that are suitable for plant establishment and the amount of cover and stabilization that may be expected. (Mastic-Arizona)
W75-10892

WATER RESOURCES OF THE LOWER ST. CROIX RIVER WATERSHED, EAST-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10945

WATER RESOURCES OF THE SNAKE RIVER WATERSHED, EAST-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10946

WATER RESOURCES OF THE LOWER MINNESOTA RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10947

WATER RESOURCES OF THE CANNON RIVER WATERSHED, SOUTHEASTERN MINNESOTA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-10948

AN ASSESSMENT OF SNOWPACK DEPLETION-SURFACE RUNOFF RELATIONSHIPS ON FORESTED WATERSHEDS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 4A.
W75-11049

GUIDELINES FOR REVEGETATION AND STABILIZATION OF SURFACE MINED AREAS IN THE WESTERN STATES,
Colorado State Univ., Fort Collins. Dept. of Range Science.
C. W. Cook, R. M. Hyde, and P. L. Sims.
Colorado State University, Fort Collins Range Science Department, Range Science Series No 16, December, 1974. 70 p, 5 fig, 9 tab, 1 append.

Descriptors: *Revegetation, *Mining, *Land reclamation, *Arid lands, *Rehabilitation, *Limiting factors, Coals, Evapotransporation, Mine wastes, Reclamation, Oil shales, Fossil fuels, Uranium radioisotopes, Soils, Drought tolerance, Precipitation intensity, Erosion, Environmental effects, Southwest US.

Rehabilitation procedures should be site specific. They must be implemented by those familiar with the ecological sturucture and successional responses characteristic of the site to be reclaimed. Factors to be considered in reclamation efforts are physical and chemical properties of the soils, degree of slope and exposure, dominant plant species present before the disturbance, and the area's climatic variability. Moisture is the limiting factor in successful rehabilitation of lands disturbed by mining and exploration for coal, oil shale, and uranium in the western states. Most areas of the West are difficult to reclaim because precipitation is not only low but the occurrences are also erratic and unpredictable. In most desert areas natural plant regeneration takes place only every five to seven years when two or more successive favorable moisture years occur. Therefore, they are subject to great stress from intermittent precipitation, extremely low and high temperatures, strong winds, and excessive evaporation. This study offers guidelines to aid reclamation efforst in the difficult western region. (Bowden-Arizona)
W75-11100

DERIVATION OF SURFACE WATER LAG TIME FOR CONVERGING OVERLAND FLOW,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W75-11156

DIFFICULTIES IN GAUGING SMALL CATCHMENTS - A CASE STUDY,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11306

HYDROLOGIC RELATIONS ON UNDISTURBED AND CONVERTED BIG SAGEBRUSH LANDS: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
D. L. Sturges.
Research Paper RM-140, March 1975. 23 p, 18 fig, 41 ref, 4 tab.

Descriptors: *Range management, *Watershed management, *Water yield improvement, Climates, Soils, Vegetation, *Snow management, Brushlands, Grasses, Shrubs, Sagebrush, Hydrology, Brush control, Snowmelt, Runoff, Management, Land management.
Identifiers: Artemisia tridentata.

Watershed management for big sagebrush range lands is discussed. Climate, soils, vegetation, snow accumulation, and water yields are described, followed by a review and discussion of how management practices alter vegetative composition and the hydrologic regime. Potential hydrologic benefits from managing blowing snow in the big sagebrush type are outlined, and research needs are highlighted. (Witt-IPC)
W75-11313

WATERSHED MANAGEMENT IN THE BLACK HILLS: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. K. Orr.
Research Paper RM-141, 12 p, March 1975. 10 fig, 26 ref.

Descriptors: *Watershed management, Climates, Geology, Soils, Vegetation, Water yield, Research priorities, Data collections, Model studies, Surface waters, Groundwater recharge, *South Dakota, Watersheds(Basins), Great plains, Water yield improvement.
Identifiers: *Black Hills(SD).

Climate, geology, soils, vegetation, and water yields are briefly described, followed by a review and discussion of watershed management research and problems unique to the Black Hills. Research needs with respect to water quality, data collection, and model development are highlighted. (Witt-IPC)
W75-11318

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

EPIFAUNAL INVERTEBRATES AS INDICATORS OF WATER QUALITY IN SOUTHERN LAKE PONTCHARTAIN,
New Orleans Univ., La. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W75-10852

PHYTOPHTHORA SPECIES IN ARIZONA: ITS OCCURRENCE IN RECYCLED IRRIGATION WATER,
California Univ., Berkeley. Dept. of Plant Pathology.
S. V. Thomson, and R. M. Allen.
Progressive Agriculture in Arizona, Vol 27, No 3, p 8-9, May-June, 1975. 2 fig, 11 ref.

Descriptors: *Recycling, *Citrus fruits, *Irrigation water, *Spores, *Fungi, *Pollutant identification, *Arizona, Return flow, Water reuse, Hazards, Tailwater, Epiphytology.
Identifiers: *Phytophthora.

A study was made of the effect of irrigation return flow to citrus orchards in the vicinity of Phoenix, Arizona, when this recycled water carried spores of the parasitic fungi Phytophthora. The presence of zoospores in water recycled to the cropped land from which it was collected posed a serious threat for several reasons, including the danger of infection to clean orchards; the pathogenicity of all species of Phytophthora, particularly since they are well adapted to an aquatic environment; and the

contact possible with tree trunks during flood irrigation. Water from 20 sites in citrus groves was sampled over a period of a year from the tailends of 4 irrigation ditches, 9 sumps, recycled water at the head-ends of 4 irrigation ditches, and project water at 2 canal locations. The method of processing the samples is given. Phytophthora spp. were isolated in 93 of 599 samples, and with one exception, all were identified as present in waste water from citrus orchards. Well-water, initially relatively free from fungi, was heavily contaminated after passage through a citrus orchard or other cropped acreage. Infection is more likely in citrus tree trunks from flood irrigation by recycled water contaminated with Phytophthora spp. when injuries to the trunk from cultivation procedures were already present. (Paylore-Arizona)
W75-10883

A SIMPLE AND INEXPENSIVE TECHNIQUE FOR DETERMINING COLORED LIGHT INTENSITY UNDERWATER,
Genesee Community Coll., Batavia, N.Y. Mathematics and Science Div.
For primary bibliographic entry see Field 7B.
W75-10919

THE GEOCHEMICAL CYCLE OF ARSENIC IN LAKE WASHINGTON AND ITS RELATION TO OTHER ELEMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W75-10922

GEOCHEMICAL RECONAISSANCE OF SURFICIAL MATERIALS IN THE VICINITY OF SHAWANGUNK MOUNTAIN, NEW YORK,
R. L. Moxham.
N Y State Mus Sci Serv Map Chart Ser, 21 p 1-20, 1972. Illus.

Descriptors: *Geochemistry, *New York, Copper, *Lead, Zinc, *Surveys, Streams, Sediments, Soils, Toxicity, *Heavy metals, Analytical techniques, Mountains, *Pollutant identification, Water pollution effects.
Identifiers: *Shawangunk Mts(NY).

A reconnaissance survy of stream sediments and soils in the vicinity of Shawangunk Mountian, Ulster, Orange, and Sullivan Counties, New York, USA was made for combined heavy metals (Cu, Pb, Zn) using dithizone field methods and other supporting laboratory techniques. A number of anomalous areas are defined by the drainage system. High concentrations were observed in the vicinity of the old Pb Zn mines and prospects that have been long known in the valley and a number of new anomalies or extensions of the previously recognized areas of mineralization were observed. These are discussed and located on the accompanying maps. Soil surveys on the valley floor showed some anomalous profiles, but difficulty in reproducing the data led to abandonment of this approach. Waters in a few small streams in the vicinities of Wurtsboro and Otisville contain potentially toxic concentrations of Pb, surface and ground waters in these areas should be analyzed before use as a water supply (for humans).--Copyright 1974, Biological Abstracts, Inc.
W75-10928

USE OF PRODUCTIVITY OF PERIPHYTON TO ESTIMATE WATER QUALITY,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W75-10936

THE MINOR AND TRACE ELEMENTS, GAS, AND ISOTOPE COMPOSITIONS OF THE PRINCIPAL HOT SPRINGS OF NEVADA AND OREGON,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W75-10937

POPULATION DYNAMICS OF PROTOZOA IN WASTEWATER,
Howard Univ., Washington, D.C. Bioenvironmental Engineering and Sciences Research Lab.
For primary bibliographic entry see Field 5D.
W75-10957

ACTIVATED CARBON IN THE WATER TREATMENT PLANT,
Massachusetts Dept. of Public Health, Lawrence. Lawrence Experiment Station.
For primary bibliographic entry see Field 5D.
W75-10992

MINITEST METHOD FOR MONITORING EFFLUENT QUALITY,
Uppsala Univ. (Sweden). Algal Assay Lab.
For primary bibliographic entry see Field 5D.
W75-10994

ADVANCES IN THE DETECTION OF WATER POLLUTANTS,
Canada Centre for Inland Waters, Burlington (Ontario).
S. Barabas.
Chemistry in Canada, Vol 27, No 6, p 26-29, June 1975. 45 ref.

Descriptors: *Analytical techniques, *Reviews, *Pollutant identification, Organic matter, Municipal wastes, Industrial wastes, Spectrophotometry, Gas chromatography, Mass spectroscopy, Remote sensing, Phenols.
Identifiers: Coprostanol, Cholesterol, Voltammetry.

A review of analytical methodology of water for the Canada Centre for Inland Waters (CCIW) from December 1973 to November 1974 is given. All research of the CCIW is done as a response to needs of a federal regional laboratory, a research component of the CCIW, or an international organization in which Canada is actively collaborating. Progress in chromatography/mass spectrometry included the methodology for analyzing organochlorinated pesticides, dithiocarbamates, and 1,4-oxathiins as well as a number of industrial pollutants. Methods were gas chromatography, high pressure liquid chromatography, thin-layer chromatography, GC/MS, NMR, and infrared. The analysis of organic pollutants (phenols, formaldehyde), inorganic pollutants (chlorides, arsenic, antimony, selenium), and detergents (phosphate, citric acid) has also been developed. Methods were spectrophotometry, of the types UV, visible, molecular fluorescence, IR, and atomic absorption. Publications have been made under electro-analytical methodology, involving activities in the area of applying selective ion electrodes to multi-element analysis. Other related developments were in voltammetric applications. Biological analysis utilized coprostanol and cholesterol as indicators of excretal pollution in sewage and industrial treatment. Radiochemistry, electron microscopy, and remote sensing studies were also discussed. (Prague-FIRL)
W75-10995

STABILITY OF NITROSAMINES IN SAMPLES OF LAKE WATER, SOIL, AND SEWAGE,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
For primary bibliographic entry see Field 5B.
W75-11019

A FIELD STUDY OF PHYSICO-CHEMICAL STATES OF ARTIFICIAL RADIONUCLIDES IN SEAWATER,
National Inst. of Radiological Sciences, Chiba (Japan). Dept. of Environmental Contamination.
For primary bibliographic entry see Field 5B.
W75-11022

RETENTION OF CADMIUM IN MICE STUDIED BY WHOLE BODY AUTORADIOGRAPHY,
National Inst. of Radiological Sciences, Chiba (Japan). Div. of Training Schools.
H. Shibata.
J Radiat Res, Vol 15, No 2, p 107-110. 1974. Illus.

Descriptors: *Cadmium, *Pollutant identifications, *Rodents, Absorption.
Identifiers: Mice, *Radiography.

The time-course of distribution of Cd (an environmental pollutant) in mice was investigated for up to 180 days after administration of 109Cd by whole body autoradiography and by radioactivity counting. Very little accumulated 109Cd was excreted from the body; it remained mainly in liver, kidneys and pancreas for a long time. The pattern of retention of 109Cd varied with organs: in liver, gastrointestinal wall and salivary glands, the concentration of 109Cd decreased with time in pancreas, spleen and lungs, it decreased very little; in kidneys, it increased. Liver retained a larger amount of 109Cd than any other organ even after a long period. In kidneys, most of 109Cd was retained in the cortex.--Copyright 1974, Biological Abstracts, Inc.
W75-11024

RELATIONS BETWEEN ALGAL POPULATIONS AND THE PH OF THEIR MEDIA,
Bor Ilan Univ., Ramat-Gan (Israel). Dept. of Life Sciences.
For primary bibliographic entry see Field 5C.
W75-11028

PATHOGENIC FREE-LIVING AMOEBAE IN ARKANSAS RECREATIONAL WATERS,
Arkansas Univ., Fayetteville. Dept. of Zoology.
L. W. Bone, and D. A. Becker.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 709, $3.25 in paper copy, $2.25 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Completion Report, 1975. 9 p, 1 tab, 11 ref. OWRT A-028-ARK(1), 14-31-0001-5004.

Descriptors: *Arkansas, *Recreation, Animal populations, Water quality, Animal pathology, Cultures, *Pollutant identification, *Pathogenic bacteria, Isolation, Human diseases.
Identifiers: *Pathogenic anoebic, Limax, *Amoebae population density, Species diversity, Pathogenic strains(Amoebae).

Selected recreational waters of Arkansas were sampled for pathogenic free-living limax amoebae. Water quality parameters were determined for correlation with amoebic population densities and species diversity. Cultural criteria and animal inoculation revealed no pathogenic strains. The feasibility of introduction and/or induction of pathogenic amoebic strains by environmental factors necessitates further ecological investigations.
W75-11053

DEVICE FOR AUTOMATIC DETERMINATION OF SUSPENDED SOLIDS CONTENT IN WATER,
Agency of Industrial Science and Technology, Tokyo (Japan). (assignee)
H. Sunahara, Y. Ishihara, and N. Nakayama.
U.S. Patent No 3,893,333, 6 p, 6 fig, 1 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 469, July 8, 1975.

Descriptors: *Patents, Water quality, *Water quality control, *Water pollution control, Water purification, *Suspended solids, Sampling, Automation, Measurement, *Pollutant identification.

The device for the automatic determination of the suspended solids content of water comprises a sample liquid collection unit, a specimen preparation unit, a filter paper feeding unit, a filter paper transfer unit, a suspended solids filtration unit, a drying unit, a weighing and display unit and a process control unit. All processes are automatic. All steps of operation are carried out by having relevant mechanisms automatically actuated by means of the timer of the automatic process control unit. Thus, the determination can be performed accurately and rapidly. Further, absence of manual operation serves to eliminate human error and ensures perfectly reliable determination. (Sinha-OEIS)
W75-11063

MERCURY CONTENTS IN BIOLOGICALLY PRESERVED SPECIMENS OF MENUKE (SEBASTES BARAMENUKE AND S. FLAMMEUS),
Iwate Prefecture Fisheries Experimental Station, Kamaishi (Japan).
S. Kamimura.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 4, p 487, April 1975. 1 tab, 2 ref.

Descriptors: Marine fish, *Metals, *Mercury, Laboratory tests, Analytical techniques, Environmental effects, *Pollutant identification.
Identifiers: *Menuke, Deep sea fish, Sebastes baramenuke, Sebastes flammeus, *Tissue analysis, *Bioaccumulation, Preserved fish, Atomic absorption spectrometry.

Five specimens of the deep sea fish, menuke (Sebastes baramenuke and S. flammeus), caught in 1939 and subsequently preserved in formaldehyde were analyzed for mercury content. Mercury content ranged from 0.05 to 0.88 mg/kg wet muscle in the specimens. Compared with recently caught menukes, there did not appear to be a significant difference in total mercury content in the preserved specimens. (Katz)
W75-11078

CONTINUOUS AUTOMATIC MONITORING OF SURFACE WATER WITH FISH,
Keuringsinstituut voor Waterleidingartikelen, Rijswijk (Netherlands).
C. L. M. Poels.
Water Treatment and Examination, Vol 29, part 1, p 46-56, 1975. 4 fig, 9 ref.

Descriptors: *Design, *Laboratory tests, *Water quality, *Toxicity, Electrical equipment, Environmental effects, Methodology, *Monitoring, Control systems, Rainbow trout, *Pollutant identification.
Identifiers: *Flow-through systems.

An electronic system for registration of fish behavior and a flow-through system for continuous monitoring of surface water with fish were designed. Advantages of these systems were discussed including more sensitive criteria than death used for the indication of toxic substances, and faster detection of toxic substances. (Katz)
W75-11079

INFLUENCE OF OIL ON NUCLEIC ACIDS OF ALGAE,
Institute of Biology of the Southern Seas, Odessa (USSR).
For primary bibliographic entry see Field 5C.
W75-11080

EFFECTS OF SOME COMPONENTS OF CRUDE OIL ON YOUNG COHO SALMON,
Alaska Univ., College. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W75-11088

THE USE OF SNAKES AS A POLLUTION INDICATOR SPECIES,
Mesa Coll., Grand Junction, Colo. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W75-11089

MEASURES OF BIODEGRADABILITY AND REFRACTORY ORGANICS IN WASTEWATERS: (ANALYSIS, INTERPRETATION, AND APPLICATION OF MEASUREMENT TECHNIQUES),
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5D.
W75-11103

THE WATER QUALITY AND BOTTOM SEDIMENT CHARACTERISTICS OF NEW JERSEY LAGOON DEVELOPMENTS,
Rutgers - the State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 5B.
W75-11104

OXIDATION OF ORGANIC COMPOUNDS IN WATER (OXIDATION ORGANISCHER VERBINDUNGEN IN WASSER),
For primary bibliographic entry see Field 5D.
W75-11118

NOTE ON THE MEASUREMENT OF THE RESPONSE OF OCEANOGRAPHIC TEMPERATURE SENSORS,
National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
For primary bibliographic entry see Field 7B.
W75-11146

BEHAVIOR OF MN, FE, CU, ZN, CD AND PB DISCHARGED FROM A WASTEWATER TREATMENT PLANT INTO AN ESTUARINE ENVIRONMENT,
Maryland Univ., College Park. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W75-11160

A STUDY OF FACTORS CONTROLLING THE CHEMICAL QUALITY OF WATER IN CARTWRIGHT CREEK BASIN, WILLIAMSON COUNTY, TENNESSEE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W75-11164

CONCENTRATION AND GENERA OF ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1973,
Illinois State Water Survey, Urbana.
S. D. Lin, R. L. Evans, and D. B. Beuscher.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-244 819, $4.25 in paper copy, $2.25 in microfiche. Report of Investigation 80, 1975. 50 p, 2 fig, 3 tab, 18 ref.

Descriptors: *Pollutant identification, *Algae, *Water quality, *Surface waters, *Illinois, *Streams, Aquatic life, Diatoms, Phytoplankton, Cyanophyta, Chlorophyta, Nutrients, Water analysis, Plankton, Analysis, Chlorophyll, Analytical techniques, Eutrophication, Aquatic microorganisms, Seasonal.
Identifiers: *Algae type, *Algae density, *Algae composition, Diversity index, Desmid, Flagellates.

During the period October 1971 to September 1973, samples of water from 35 Illinois streams at 41 locations were collected monthly and examined to determine the type, genera, and concentration of algae. Data for the 2-year period have been evaluated for algal density, composition, diversity indices, and seasonal succession for each location. Most stations had algal densities of from 500 to 2000 cts/ml, had between 15 and 24 different algal genera (41 genera total), and had a diversity index equal to or greater than 1.10. Stations on the Fox, Des Plaines, and Kaskaskia Rivers had algal densities in excess of 5000 cts/ml. This report should be useful to persons responsible for developing, regulating, or managing water resources in Illinois. (Henley-ISWS)
W75-11165

SPECIFIC CONDUCTANCE METHOD FOR IN SITU ESTIMATION OF TOTAL DISSOLVED SOLIDS,
Northern Forest Research Center, Edmonton (Alberta).
T. Singh, and Y. P. Kalra.
Journal of the American Water Works Association, Vol 67, No 2, p 99-100, February 1975. 1 fig, 4 tab, 10 ref.

Descriptors: *Specific conductivity, *Dissolved solids, *Water analysis, *On-site tests, *Conductivity, Water properties, Electrical conductance, Physical properties, Evaluation, Analytical techniques, Estimating, Instrumentation, Canada, Testing procedures, Chemistry, Statistical models, Mineralogy, Ions.

Two methods are commonly used for determining total dissolved solids in water. Another method was proposed - determination by means of electrical conductance measurement. An excellent relationship was discovered between specific conductance and total dissolved solids of mountain streams. (Henley-ISWS)
W75-11167

EVIDENCE OF ATMOSPHERIC TRANSPORT OF OZONE INTO URBAN AREAS,
New York State Dept. of Environmental Conservation, Albany. Div. of Air Resources.
P. E. Coffey, and W. N. Stasiuk.
Environmental Science and Technology, Vol 9, No 1, p 59-62, January 1975. 6 fig, 5 ref.

Descriptors: *Ozone, *Pollutant identification, *Air pollution, Rural areas, Cities, Mixing, Advection, Path of pollutants, *New York, Spring, Summer, *Path of pollutants.

In late spring and continuing throughout the summer, concentrations of ozone in excess of 0.08 ppm are commonly found in rural areas of New York State. Widely separated rural sites measure similar ozone concentrations with very slight diurnal fluctuations. During episodes of high rural ozone concentrations, urban areas also experience high ozone peak concentrations, typically in the early afternoon. A transport and mixing hypothesis was made which interprets these urban ozone peak concentrations as primarily the result of the high background level of ozone and not local photochemical generation. (Sims-ISWS)
W75-11169

AQUATIC WEED FIELD TEST PROGRAM USING A CO2 ELECTRIC DISCHARGE CONVECTION LASER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
P. A. Smith.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 107-109, August 1974.

Descriptors: *Aquatic weed control, *Irradiation, Radiation, Equipment, Design, Mechanical equipment, Pollutant identification.
Identifiers: *Laser.

A field prototype closed-cycle carbon dioxide electric discharge convection laser was fabricated and tested. One end of the laser glass tube had a mirror with completely reflective material; the other end had a mirror with a 3/4 inch hole in the center which was sealed with a sodium chloride window to form a vacuum. The laser beam is formed when stimulated photons traveling along the axis of the glass tubing contain enough energy to be emitted from the sodium chloride window. The efficiency of the laser is 5 to 12%. Much of the input power is converted to heat. All of the components of the system generate heat (except the heat exchangers) which must be removed by cooling with water. The laser head consists of four discharge tubes through which the laser gas (4% carbon dioxide, 39% nitrogen, 57% helium) circulates. Optical power is extracted using folded unstable optics and transmitted to the atmosphere through the sodium chloride window. The available optical power is over six kilowatts and the design output power 2-4 kilowatts. Enclosures protect against shock, and plate glass shields protect the operator from reflected radiation. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11208

CHELATION STUDY OF COPPER (II): FULVIC ACID SYSTEM,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W75-11219

EXTRACTION AND ANALYTICAL TECHNIQUES FOR PESTICIDES IN SOIL, SEDIMENT, AND WATER,
Wisconsin Univ., Madison. Water Resources Center.
G. Chesters, H. G. Pionke, and T. C. Daniel.
In: 'Pesticides in Soil and Water,' Soil Science Society of America, Inc., Madison, Wisconsin, 1974, p 451-549. 18 tab, 291 ref, append.

Descriptors: *Pesticide residues, *Analytical techniques, *Sediments, *Soils, *Water, *Separation techniques, Persistence, DDE, DDT, Polychlorinated biphenyls, 2,4-D, Herbicides, 2,4,5-T, Dalapon, Dieldrin, Endrin, Heptaclor, Aldrin, Diquat, Paraquat, Monuron, Aliphatic pesticides, Carbamate pesticides, Thiocarbamate pesticides, Halogenated pesticides, Chlorinated hydrocarbon pesticides, Aroclors, Organophosphorus pesticides, Phosphothioate pesticides, Triazine pesticides, Uracil pesticides, Urea pesticides, Sampling, Chemical analysis, Laboratory tests, Measurement, Reliability, Diazinon, *Pollutant identification, *Reviews, *Bibliographies.

Pesticide extraction and sample analysis is discussed without elaborating on specific procedures. Methodological design and evaluation is largely empirical, circumvents lack of knowledge, and compensates for the effect of unknown or illdefined relationships. Empirically derived and tested techniques must be clearly defined and are only valid under the original experimental conditions, and should not be extrapolated beyond limits imposed by those conditions without experimentation. Factors which must be considered prior to sample collection, methods for sampling soils, waters, and sediment; methods currently used to preserve samples; and extraction, cleanup, and analysis of organic pesticides are discussed. Tabulated data defining and evaluating methodology for pesticide classes and individual compounds are presented giving extractant, extraction technique, fortification conditions to determine recovery efficiency of added pesticide, pesticide concentration in fortified sample, equilibration time and conditions between fortification and extraction, sample pretreatment, and recovery values. Systemized monitoring is discussed. Development of methods and equipment for complex multi-residue analysis may have far-reaching effects of monitoring programs. An appendix gives the common and chemical names of organochlorine pesticides, organophosphorus insecticides, acidic pesticides, carbamate, substituted urea, uracil, benzonitrile, analides, analines, amide pesticides, and triazine and dipyridinium. (Buchanan-Davidson--Wisconsin)
W75-11236

THE UTILIZATION OF SUN-GLINT IN A STUDY OF LAKE DYNAMICS,
Canada Centre for Inland Waters, Burlington(Ontario).
R. P. Bukata, and W. D. McColl.
In: Proceedings No 17, American Water Resources Association, Remote Sensing and Water Resources Management, p 351-367, 1973. 10 fig, 6 tab, 4 ref.

Descriptors: *Lakes, *Remote sensing, *Aerial photography, *Reflectance, Lake Ontario, Upwelling, Thermal properties, Circulation, Mass transfer.
Identifiers: *Sun-glint.

Features demarcated by mirror-reflected solar illumination (sun-glint) in aerial photographs of Lake Ontario and the role of sun-glint in evaluating the nature of dynamic processes occurring within the lake which display surficial characteristics is described. Under sun-glint conditions visible and infra-red photography may delineate dynamic interfaces between thermally different water masses. A time-sequential series should enable quantitative estimates of the nature of dynamic processes to be made. Sun-glint usage requires modification of surface solar reflective properties by lake dynamics. Imagery of upwelling areas indicated that surficial glitter patterns are induced when spatial variations of thermal time-gradients change. Such conditions are present in onset and decay phases of upwelling. Sun-glint discerned dynamics of river mouth thermal effluent injections, surface slicks, coastal mass transport, and lake circulation patterns if conditions were not in a dynamic equilibrium state. Sun-glint was used to evaluate the dynamics of the June 7, 1972 upwelling off the north shore of Lake Ontario. Using aerial photography and ground-truth data, it was concluded that spatial and temporal changes in thermal time-gradient are required to produce surface features discernable in sun-glint. (Bauchanan-Davidson--Wisconsin)
W75-11239

PRELIMINARY INFORMATION ON THE NATURE OF ORGANIC MATTER IN THE SURFACE SEDIMENTS OF LAKES HURON, ERIE, AND ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W75-11240

THE TOXICITY OF DRILLING FLUID COMPONENTS TO AQUATIC BIOLOGICAL SYSTEMS, A LITERATURE REVIEW,
Fisheries and Marine Service, Winnipeg (Manitoba).
For primary bibliographic entry see Field 5C.
W75-11266

SOME OBSERVATIONS CONCERNING PREPARATION AND STORAGE OF STREAM SAMPLES FOR DISSOLVED INORGANIC PHOSPHATE ANALYSIS,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
A. H. Johnson, D. R. Bouldin, and G. W. Hergert.
Water Resources Research, Vol 11, No 4, p 559-562, August, 1975. 3 fig, 9 ref, 4 tab.

Descriptors: *Water analysis, *Phosphates, *Storage, Time, Inorganic compounds, Analytical techniques, Water pollution sources, Trace elements, Water pollution, Phosphorus compounds, Water properties, Freezing, Refrigeration, Pollution identification, New York.
Identifiers: Fall Creek(NY).

The influence of storage conditions and duration of storage was studied by using about 100 stream samples from Fall Creek collected near Ithaca, New York. Freezing and refrigerated storage were unsatisfactory, since changes in measured concentrations were usually observed after relatively short periods of time (24 hr). An isobutanol extraction procedure is described which minimizes storage problems and is useful for routine analysis of water samples for dissolved inorganic phosphate. (Witt-IPC)
W75-11336

DETERMINATION OF CHEMICAL OXYGEN DEMAND, COD(CR), IN WASTE WATERS OF PULP AND PAPER MILLS (BESTIMMUNG DES CHEMISCHEN SAUERSTOFFBEDARFES, CSB(CR), IN RESTABWAESSERN VON ZELLSTOFF UND PAPIERFABRIKEN).
English translation of Wochenblatt fur Papierfabrikation, Vol 103, No 9, p 326-327, May 15, 1975. 1 illus.

Descriptors: *Pulp wastes, *Water analysis, *Chemical oxygen demand, *Testing procedures, Testing, Analytical techniques, Sampling, Water quality, Water pollution, Water pollution sources, Pollutant identification.
Identifiers: *Potassium dichromate.

This proposed method for COD determination by means of dichromate is not identical with the DEV (Deutsche Einheitsverfahren zur Wasser-, Abwasser- und Schlammuntersuchung) H 4.2 standard method and is to be used only if control experiments show agreement with that method, which has been officially approved. (Ward-IPC)
W75-11337

INTERFERENCE OF MERCURY(II) IN THE COLORIMETRIC DETERMINATION OF INORGANIC PHOSPHATE IN WATER,
Massey Univ., Palmerston North (New Zealand).
R. W. Tillman, and J. K. Syers.
The Analyst, Vol 100, No 1190, p 322-324, May, 1975. 7 ref, 2 tab.

Descriptors: *Water analysis, *Phosphates, *Mercury, *Colorimetry, Inorganic compounds, *Analytical techniques, Chemical analysis, Water pollution sources, Trace elements, Water pollution, Chemical precipitation, Phosphorus compounds, Water chemistry, Water properties, Water quality, *Pollutant identification.

Mercury(II) caused a significant positive interference in the colorimetric determination of inorganic phosphate in the range 0-0.080 microgram/liter by the procedure of Murphy and Riley. The interference resulted from the formation of a precipitate that varied in particle size and was not always visible to the naked eye. With higher levels of inorganic phosphate (0.800 microgram/liter) a coarse precipitate formed that partially removed the molybdophosphate complex ion from solution. Elimination of this interference was achieved by complexing the mercury(II) with chloride or thiosulfate. (Witt-IPC)
W75-11340

MODIFICATION OF THE IODIMETRIC TITRATION METHOD FOR THE DETERMINATION OF BROMIDE AND ITS APPLICATION TO MIXED DOMESTIC-INDUSTRIAL WASTE EFFLUENTS,
National Environmental Research Center, Cincinnati, Ohio. Methods Developments and Quality Assurance Research Lab.

D. F. Bender.
The Analyst, Vol 100, No 1191, p 400-404, June, 1975. 5 ref, 2 tab.

Descriptors: *Waste water(Pollution), *Water analysis, *Volumetric analysis, *Bromides, *Analytical techniques, Chemical analysis, Water pollution sources, Hydorgen ion concentration, Instrumentation, Municipal wastes, Industrial wastes, Wastes, Iodides, Halogens, *Pollutant identification.

The iodimetric titration method for the determination of bromide involves the observation of various color changes, making the method unsuitable for use with samples that are highly colored. A modification is described, which extends the usefulness of the method to highly colored samples, such as sewage and industrial effluents. A pH meter was substituted for indicators and the use of standardized concentrations and amounts of reagents was incorporated into the method. The procedural steps were studied in order to optimize the sensitivity while minimizing interfering side reactions. The modified method was applied to a mixed domestic-industrial effluent spiked with bromide and iodide. The experimental details and statistical parameters for samples spiked at different levels are presented. (Witt-IPC)
W75-11341

APPARATUS FOR CONCENTRATION OF VOLATILE ORGANIC POLLUTANTS IN WATER,
Tekmar Co., Cincinnati, Ohio.
J. O. Grote.
American Laboratory, Vol 7, No 7, p 47-48, 50, July, 1975. 7 fig, 3 ref.

Descriptors: *Organic compounds, *Water analysis, *Pollutant identification, *Instrumentation, Analytical techniques, Water pollution sources, Trace elements, Sampling, Water chemistry, Water properties, Waste water(Pollution), Potable water, Pollutants.

In the liquid sample concentrator described, produced by Tekmar Company, an inert gas is bubbled through a water sample containing organic compounds. The volatile organics exhibiting low solubility in water are quantitatively partitioned into the gas phase, and the gas is passed through a trap that retains the organics but allows the water vapor and the purge gas to pass through. The concentrated sample is passed to a measuring instrument. By varying the type of adsorbent in the trap, the specificity of the technique can be changed to accommodate various classes of organic compounds. Data are presented illustrating the recovery of organic compounds such as acetone, methylene chloride, chloroform, carbon tetrachloride, and benzene from spiked water and drinking water. The apparatus is a useful tool for the analysis of volatile organic pollutants in water at the parts-per-billion level. Its compatibility with existing gas chromatographs and detector systems makes it adaptable to a variety of gas chromatographs and measurement devices. (Witt-IPC)
W75-11342

INTERFERENCE OF SULFATE ION ON SPADNS (SODIUM 2-(SULFOPHENYLAZO)-1,8-DIHYDROXYNAPHTHALENE-3,6-DISULFONATE) COLORIMETRIC DETERMINATION OF FLUORINE IN WASTE WATERS,
Calgon Corp., Pittsburgh, Pa. Calgon Labs.
R. F. Devine, and G. L. Partington.
Environmental Science and Technology, Vol 9, No 7, p 678-679, July, 1975. 4.ref.

Descriptors: *Waste water(Pollution), *Water analysis, *Colorimetry, *Sulfates, *Fluorides, Analytical techniques, Chemical analysis, Electrodes, Ions, Water pollution sources, Trace elements, Water chemistry, Water properties, Water pollution, *Pollutant identification.
Identifiers: Sodium 2-(sulfophenylazo)-1,8-dihydroxynaphthalene-3,6-disulfonate.

The approved method for the determination of fluoride ion is the SPADNS colorimetric procedure preceded by distillation from a sulfuric acid solution. This procedure is based upon the measurement of the loss of color of a zirconium-dye lake owing to the reaction of fluoride ion with zirconium to form a colorless complex ion. The dye used is sodium 2-(p-sulfophenylazo)-1,8-dihydroxynaphthalene-3,6-disulfonate (SPADNS). Serious errors in this method are caused by sulfate ion carry-over from the initial distillation step. The use of a fluoride ion electrode is suggested as a better method. (Witt-IPC)
W75-11343

CHROMATOGRAPHIC DETERMINATION OF PHENOLS IN WATER,
Ames Lab., Iowa.
C. D. Chriswell, R. C. Chang, and J. S. Fritz.
Analytical Chemistry, Vol 47, No 8, p 1325-1329, July, 1975. 2 fig, 3 tab, 13 ref.

Descriptors: *Water analysis, *Phenols, *Anion exchange, *Gas chromatography, Separation techniques, Analytical techniques, Chemical analysis, Natural streams, Potable water, Water chemistry, Water properties, Water quality, Water pollution sources, Pollutants, *Pollutant identification, Organic compounds, Resins, Ion exchange, Chromatography, Oxidation, Chlorination.
Identifiers: A-26 resin, Chlorinated phenols.

Phenols in natural waters and treated drinking water are determined by sorption on macroporous anion-exchange resin (A-26 resin from Rohm and Haas Chemical Company), elution with acetone, and measurement by gas chromatography. Techniques are given for preventing phenol losses caused by chlorination, oxidation, and other reactions during their determination. Common inorganic ions and many organic substances cause no interference; neutral organics that are retained by the resin can be removed by a methanol wash. The method gives accurate results for phenol, alkyl-, and chloro-substituted phenols in the parts/billion to parts/million concentration range. (Witt-IPC)
W75-11344

5B. Sources Of Pollution

EXPERIMENTAL STUDY OF THE COOLING WATER SYSTEM, SETUBAL POWER PLANT, RIO SADO, PORTUGAL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
G. Jirka, J. Lee, and D. R. F. Harleman.
Ralph M. Parsons Laboratory for Water Resources and Hydrodynamics, Report No 185, April 1974. 101 p, 24 fig, 4 tab, 7 ref.

Descriptors: *Powerplants, *Design criteria, Optimum development plans, *Cooling water, Hydraulic models, Channels, *Discharge(Water), Thermal pollution.
Identifiers: *Portugal(Rio Sado), Once-through cooling system, Cooling water systems.

The Setubal power Plant is a fossil fueled generating station located on the Rio Sado in Portugal. It employs a once-through cooling system. The objective was to arrive at an optimal design for the cooling water system with respect to two criteria: (1) minimization of heat recirculation at the cool water intake and (2) small surface velocities in the vicinity of the discharge zone to avoid any hazard to navigation. Two designs for the condenser discharge were considered: discharge by means of a surface channel and discharge by means of a submerged multiport diffuser. The intake design is a skimmer wall that selectively withdraws cooling water from the ambient stratified water. Existing theoretical models were used to obtain preliminary estimates of design parameters. A hydraulic scale model for the discharge-intake zone was constructed. Tests were carried out to investigate the variability of the criteria of concern to the design parameters under the full range of ambient conditions. Based on the results of the experiments, a surface discharge channel is recommended as an optimal design for the cooling water system. Experimental data for both the surface discharge and the submerged diffuser were compared with existing mathematical models.
W75-10855

OCCURRENCE OF 2, 4, 5-T AND PICLORAM IN SURFACE RUNOFF WATER IN THE BLACKLANDS OF TEXAS,
Agricultural Research Service, College Station, Tex.
R. W. Bovey, E. Burnett, C. Richardson, M. G. Merkle, and J. R. Baur.
Journal of Environmental Quality, Vol 3, No 1, p 61-64, January-March, 1974. 8 tab, 12 ref.

Descriptors: *2-4-5-T, *Runoff, *Herbicides, *Irrigation water, *Return flow, Rainfall, Streams, Small watersheds, Water sources, Texas, *Path of pollutants, Water pollution sources.
Identifiers: *Picloram, Texas blacklands.

A study was made to determine the amount of 2, 4, 5-T and picloram in surface runoff water from pastures and rangeland sprayed with the herbicides as a result of major rainfalls following treatments. Soil, grasses, and runoff water were analyzed periodically following herbicide treatment. Herbicide content in the soil remained low throughout the investigation. Herbicide content on grass was high immediately following treatment, but degraded rapidly. Plant washoff was the main source of the herbicide in runoff water. Concentrations were moderately high if heavy rainfall occurred immediately after herbicide treatment, but were low if major storms occurred one month or longer after the treatment. No damage occurred to cotton or sorghum located adjacent and below the herbicide-treated watersheds from either spray drift or surface runoff water. (Mastic-Arizona)
W75-10895

TWO-DIMENSIONAL, HYDROSTATIC SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W75-10901

FLOOD RUNOFF FROM URBAN AREAS,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. H. McCuen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 504, $4.75 in paper copy, $2.25 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No. 33, June 1975. 70 p. OWRT A-025-MD(2). 14-31-0001-5020.

Descriptors: Simulation analysis, Path of pollutants, *Urban hydrology, *Storm water, Management, *Storage, Land use, Water quality, Floods, Runoff, Cities, Urbanization, Forecasting, Estimating, *Peak discharge, *Design floods, *Runoff forecasting, Model studies.

This study examined several important aspects of urban water resources management and resulted in the following: (1) a set of prediction equations that can be used to estimate different land use characteristics from selected demographic characteristics; (2) a set of design curves relating peak discharge and the land use intensity rating, as a function of the exceedence probability (i.e., return period); (3) a set of design curves showing the effect of rooftop detention on peak discharge for

various land use intensity ratings and exceedence probabilities; (4) a computer model of a storm water detection facility; (5) a model study compared the effect of the individual-site approach to the regional approach to storm water detention; (6) a set of design curves that can be used in the design of storm water detention facilities for areas characterized by high concentrations of impervious areas (e.g., streets and parking lots); (7) a water quality simulation model that can predict the level of eight pollutants in runoff from urban and suburban streets; (8) a set of prediction equations that can be used to predict water use of selected commercial establishments.
W75-10904

A COMPUTER PROGRAM PACKAGE FOR AQUATIC ECOLOGISTS,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 2H.
W75-10908

THERMAL RESPONSE OF HEATED STREAMS, SOLUTION BY THE IMPLICIT METHOD,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
P. P. Paily, and E. O. Macagno.
IIHR Report No. 165, May 1974. 71 p, 10 fig, 1 tab, 23 ref, 2 append. NSF Grant GK-35910X.

Descriptors: *Path of pollutants, *Thermal pollution, *Ice cover, *Numerical analysis, *Mathematical models, *Mississippi River, Dispersion, Rivers, Winter, Analysis, Equations, Temperature, Distribution, Effluents, Heated water, Discharge(Water), Diffusion.

The thermal response of natural streams to artificial heat inputs from thermal power stations was mathematically represented by the one-dimensional convection-diffusion equation, for fully mixed flow conditions. The unsteady one-dimensional convection-diffusion equation is a nonlinear parabolic partical differential equation, due to the presence of the surface heat exchange term which is a complex function of the water temperature. In general, it has been difficult to obtain closed-form solutions of this governing equation by analytic methods. A numerical solution, utilizing a predictor-corrector scheme, was developed to predict the transient-period as well as the steady-state temperature distributions in thermally loaded streams under changing thermal input rates and meteorological conditions. An example case was solved for several different conditions and the results were presented. (Adams-ISWS)
W75-10909

THE GEOCHEMICAL CYCLE OF ARSENIC IN LAKE WASHINGTON AND ITS RELATION TO OTHER ELEMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
E. A. Crecelius.
Limnology and Oceanography, Vol 20, No 3, p 441-451, May 1975. 3 fig, 2 tab, 29 ref. NSF Grant GI33325X.

Descriptors: *Washington, Path of pollutants, *Arsenic compounds, *Lake sediments, *Sodium arsenite, Analytical techniques, *Water analysis, Inorganic compounds, Separation techniques, Evaluation, Neutron activation analysis, Chemistry, Instrumentation, Sediments, Chemical properties, Chemical analysis, Aluminum, Biological properties, Iron, Manganese, Geochemistry, Dusts, Rainfall, Suspended solids, Pollutant identification,
Identifiers: *Lake Washington(Wash), Antimony, Copper smelter.

Abnormally high arsenic concentrations (greater than 200 ppm dry weight) in the surface sediments of Lake Washington are attributed to atmospheric input of partially soluble arsenic-rich dust from a copper smelter 35 km upwind and removal of dissolved As from the lake water by bacteria on an inorganic reaction. The suspended matter in the deeper lake water contains 9% iron, 8% manganese, and 350 ppm arsenic. Cores dated by Pb210 indicate that As levels began to increase in the sediments when the smelter began operation in 1890. An arsenic budget for the lake shows equal supplies from the atmosphere and from rivers, and removal by outflowing water (45%) and by accumulation in the sediments (55%). A similar cycle was observed for antimony which is released by the smelter in much smaller amounts than arsenic. About two-thirds of the As in rain and lake water was in the form of arsenate; however, in the interstitial water 55% of the dissolved As was present as arsenite and a few percent as dimethylarsinic acid. (Henley-ISWS)
W75-10922

SURFACE TENSION REDUCTIONS AND URBAN WASTES IN THE NEW YORK BIGHT,
State Univ. of New York Stony Brook. Marine Sciences Research Center.
C. D. Hardy, and E. R. Baylor.
Journal of Geophysical Research, Vol 80, No 18, p 2696-2699, June 20, 1975. 1 fig, 21 ref.

Descriptors: *Path of pollutants, *Surface tension, *Surfactants, Water properties, *Monomolecular films, New York Properties, Tension, Surfaces, Wettability, Detergents, Water pollution sources, Sewage sludge, Water quality, Sea water, Sludge disposal, Films, Waste disposal, Sewage effluents, Pollutants, Metals, Aerosols.
Identifiers: *Urban wastes, *New York Bight, *New York Harbor, Oil drop method, Lipophilic pollutants, Metallic pollutants.

The distribution of surface tension in the New York Bight was calculated from oil drop spreading measurements at sea. Reductions in surface tensions of greater than 30% (less than 50.9 dyn/cm) of that calculated for clean seawater were associated with sewage sludge dumping and urban waste discharges. The potential role of surface films as an agent in the transport of metallic and lipophilic pollutants was briefly discussed. (Henley-ISWS)
W75-10927

QUALITY OF WATER IN AQUIFERS OF THE AMARGOSA DESERT AND VICINITY, NEVADA,
Geological Survey, Denver, Colo.
B. P. Robinson, and W. A. Beetem.
Available from National Technical Information Service, Springfield, Va 22161 as USGS-474-215 (NTS-123), $5.45 in paper copy, $2.25 in microfiche. Report USGS-474-215 (NTS-123), 1975. 64 p, 1 fig, 1 tab.

Descriptors: *Water pollution sources, *Groundwater, *Nuclear explosions, *Nevada, Water quality, Water wells, Pumping, Aquifers, Chemical analysis, Data collections, Sampling.
Identifiers: *Nevada Atomic Test Site.

The U.S. Geological Survey has interpreted the rate and direction of groundwater movement away from the Nevada Atomic Test Site by using hydrologic data including results of hydraulic tests and geophysical surveys in deep wells. Samples of water were collected from 25 sources including supply wells, irrigation wells, and springs in the Pahrump, Amargosa, and Indian Spring Valleys and at the Nevada Test Site during a single sampling sweep. Analyses in the field indicated that the composition of the pumped or discharging water approximated the composition of the aquifer water. The composition of the water did not change with extended pumping time. On-site examination of the samples of water included measurement of specific conductance, temperature, pH, dissolved oxygen, dissolved carbon dioxide, alkalinity, and ferrous-ferric iron ratios. Laboratory examination of the samples included chemical, radiochemical, and spectrochemical analyses. (Woodard-USGS)
W75-10932

HEAVY METALS AND OTHER TRACE ELEMENTS,
Geological Survey, Menlo Park, Calif.
H. V. Leland, E. D. Copenhaver, and D. J. Wilkes.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1635-1656, June 1975. 1 tab, 201 ref.

Descriptors: *Water pollution sources, *Heavy metals, *Trace elements, *United States, *Reviews, Surface waters, Sediments, Rivers, Estuaries, Natural streams, Ecosystems, Biological communities, Marine biology.

This literature review describes the effects of heavy metals and trace elements in surface waters of the United States under the following headings: (1) Trace Elements in Natural Waters; (2) Trace Elements in Sediments; (3) Physical-Chemical Forms of Trace Elements; (4) Trace Element Partitioning in Aquatic Ecosystems; and (5) Bioaccumulation and Toxicity of Trace Elements. Scattered and intensive chemical surveys of natural waters in the U.S. continue to show that many trace elements, including As, Cd, Pb, Hg, and Zn, are widely distributed but at low concentrations relative to the limits established for drinking waters. The geographic distributions of Cd, Pb, and Zn have distinct regional patterns. Pollution sources and rainfall are apparently the major contributors of Cd and Pb in river water. (Woodard-USGS)
W75-10934

REVIEW OF CONFERENCE ON HYDROLOGY OF DEEP SEDIMENTARY BASINS,
Tulsa Univ., Okla. Dept. of Earth Sciences.
P. A. Dickey, and P. H. Jones.
American Association of Petroleum Geologists Bulletin, Vol 59, No 7, p 1198-1201, July 1975.

Descriptors: *Sedimentology, *Hydrology, *Geology, *Reviews, *Conferences, Groundwater, Subsurface waters, Hydrogeology, Groundwater movement, Sediments, Oil-water interfaces, Sediment-water interfaces, Permeability, Oil shales, Evaluation, Water pollution, Oil pollution.
Identifiers: *Deep sedimentary basins.

The conference on Hydrology of Deep Sedimentary Basins sponsored by the American Association of Petroleum Geologists (AAPG) was held at Shangri-la resort, Afton, Oklahoma, October 7-11, 1974. Participants numbered 60, and included representatives from oil company laboratories, government bureaus, and universities. The conference produced an interesting difference of opinion on the movement of deep subsurface waters. Most of the hydrologists present, and some of the petroleum geologists, believe that deep subsurface pore waters are moving both parallel with and perpendicular to bedding planes. The movement is caused by the compaction of sediments, phase changes in the minerals, and head differences caused by topography. These people believe that the salt in subsurface brines was concentrated by reverse osmosis, that hydrodynamically tilted water-oil contacts are common, and that updip or downdip flows of water in sandstones can enhance or destroy petroleum traps. Others believe that shales commonly lose all their permeability to water, at least in a direction perpendicular to the bedding. (Woodard-USGS)
W75-10935

USE OF PRODUCTIVITY OF PERIPHYTON TO ESTIMATE WATER QUALITY,
Geological Survey, Menlo Park, Calif.
L. J. Tilley, and W. L. Haushild.

Journal Water Pollution Control Federation, Vol 47, No 8, p 2157-2171, August 1975. 8 fig, 4 tab, 29 ref.

Descriptors: *Water quality control, *Path of pollutants, *Waste water disposal, *Washington, Streams, Estuaries, Methodology, *Periphyton, Growth rates, Chlorophyll, Nutrients, Phosphates, Ammonia, Nitrates, Water quality, Streamflow, Flow rates, *Bioindicators, Pollutant identification.
Identifiers: *Duwamish-Green River(Wash).

In a comprehensive study of the effects of changes in wastewater disposal practices on the Duwamish River (Wash.) estuary, the amount and rate of change of chlorophyll a was used to determine the net primary productivity of the periphyton growing upstream from the estuary in the Duwamish-Green River. The net primary productivity varied among three stream environments sampled in the study during the summer and fall of 1969. Net primary productivity averaged 3.6 mg/wk/sq m in a mountainous reach, increased to 6.2 in a lowland reach, and was as much as 17.5 in an estuarine reach. The productivity of periphyton was related to concentration of selected nutrients (nitrate, nitrite, ammonia, and phosphate) in the stream. The small temperature changes along the stream probably had a minor influence on the differences in periphyton growth rates. (Woodard-USGS)
W75-10936

ILLINOIS LANDFILL LAW MAY EFFECT NEARBY STATES.
Solid Wastes Management, Vol 17, No 8, p 36, 46, 58, 72, 78-79, August, 1974.

Descriptors: *Landfills, *Solid wastes, *Waste disposal, *Legislation, *Illinois, Regulation, permits, Environmental sanitation, Water pollution sources, Water pollution control.

The Pollution Control Board of Illinois was developed a broad-based policy on the control of landfill operations. The key provision states that no person in any state may allow a sanitary site to be maintained so as to threaten or permit the discharge or emission of pollutants into the environment so that they may in any way contaminate the air and/or water within the state of Illinois. This means that any individual or organization that is in violation of the law is liable for his act even though the initial polluting may have occurred outside of the state of Illinois. An outline of the legislation is presented. Subjects covered include permits, methods of operation, type of wastes that may be deposited, features that must be included in a landfill site, and items that must be contained in an application for a landfill permit. Development permits are required for the development of any new solid wastes management site or for the modification of an existing site. Operating permits are required to operate a site. Experimental permits will be issued for methods that do not satisfy the current standards if the applicant can show proof that the method has a reasonable chance for success and that there are minimal environmental hazards. (Orr-FIRL)
W75-11011

PREVENTING BACKFLOW IN PIPING CROSS CONNECTIONS,
Watts Regulator Co., Lawrence, Mass.
J. F. Keegan.
Plant Engineering, Vol 29, No 8, p 229-231, April 17, 1975. 6 fig, 2 tab.

Descriptors: *Water pollution sources, *Potable water, Pipes, Water supply.
Identifiers: Cross connections, Piping, Backflow.

Inadvertent contamination of potable water supplies may be avoided by preventing backflow in piping cross connections. Two types of uncontrolled cross connections which permit unwanted reverse flow are back siphonage and backpressure. Siphonage occurs when a water supply system is subjected to an unexpected pressure drop. Backflow from backpressure results when a system component such as a pump or a boiler under pressure produces a pressure exceeding that of the water supply main. In some cases, a combination of back siphonage and backpressure cause backflow. To overcome the possibility of contamination by backflow, in-plant cross connection control programs should be implemented. Backflow prevention devices are described. These cross connections are either the inlet type or the pressure type. In the inlet type, the connection is used for filling a receptacle open to the atmosphere while in the pressure type, water supply is connected to another line or to a pressurized vessel. In the latter, connections are often fitted with shutoff or check valves to isolate nonpotable systems from the potable supply. Selection of the proper prevention device depends upon the type of cross connection to be connected and the degree of hazard existing. (Prqgue-FIRL)
W75-11018

STABILITY OF NITROSAMINES IN SAMPLES OF LAKE WATER, SOIL, AND SEWAGE,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
R. L. Tate, III, and M. Alexander.
Journal of the National Cancer Institute, Vol 54, No 2, p 327-330, February, 1975. 5 fig, 17 ref.

Descriptors: *Nitrogen compounds, *Soil environment, *Sewage, *Lakes, Water pollution sources, Microbial degradation, Persistance, Pollutant identification, Laboratory tests, Testing, Public health, *Path of pollutants.
Identifiers: *Nitrosamines, *Carcinogens.

Interest in nitrosames is prompted because of their possible carcinogenic, teratogenic, and mutagenic properties. Their possible synthesis in fresh waters, polluted waters, and soil is of some concern because the precursors are widespread. The significance of the formation of N-nitroso compounds depends upon the stability of these carcinogens in natural systems and their possible entry into public water supplies, fish, and edible plants. This study assessed the stability of simple nitrosamines (N-nitrosodimethylamine, N-nitrosodiethylamine, and N-nitrosadi-n-propylamine) in lake water, soil, and sewage. No degradation of these nitrosamines was observed in lake water during a 3.5 month period. A slow disappearance was noted in soil after a lag of several weeks. The loss was more rapid in sewage, but even after two weeks more than half of the nitrosamine remained. The results of the experiments of sewage and soil suggest a microbial involvement in the slow decomposition of the nitrosamines. (Orr-FIRL)
W75-11019

SOME OBSERVATIONS ON BEHAVIOR OF THE TREATED SEWAGE DISPOSED IN THE SEA,
Nihon Univ., Tokyo (Japan). Dept. of Fisheries.
D. Inaba, S. Arazaki, H. Murooka, Y. Deguchi, and S. Kadota.
Bulletin of the College of Agriculture and Veterinary Medicine, Nihon University, No 31, p 54-78, 1974. 15 fig, 8 tab, 4 ref.

Descriptors: *Sludge disposal, *Oceans, *Environmental effects, Marine animals, Analytical techniques, Sewage treatment, Monitoring, Pollutant identification, Water quality control, Ultimate disposal, *Path of pollutants, Dispersion, Mixing.
Identifiers: Pollutant dispersal, *Japan.

A survey of marine disposal of sludge from sewage treatment was conducted in Japan, in order to obtain information on dispersal characteristics in the ocean and to detect effects of this disposal method on water quality and marine life. Color differentiation between sludge water surface and clean water areas was observed just after introduction of the sludge. Vertical sedimentation rate was measured by optical monitoring through marine television, echo sounder devices, and an underwater illuminometer. Particles precipitated into the water at different rates of descent due to specific gravity and differences in particle shape. Water quality analysis was done in relation to ammonia density, BOD, and pH parameters, indicating that these factors did not cause any significant qualitative changes to the environment. Strong winds and high waves provided a rapid dispersal and mixing of the sludge in the aquatic environment. These rapid mixing and dispersal factors are also illustrated by an unexpectedly low general and coliform bacteria count. (Prague-FIRL)
W75-11020

A FIELD STUDY OF PHYSICO-CHEMICAL STATES OF ARTIFICIAL RADIONUCLIDES IN SEAWATER,
National Inst. of Radiological Sciences, Chiba (Japan). Dept. of Environmental Contamination.
Y. Nagaya, and K. Nakamura.
Journal of the Oceanographical Society of Japan, Vol 30, p 179-184, 1974. 1 fig, 3 tab, 15 ref.

Descriptors: *Radioactive wastes, *Fallout, Filters, *Radioisotopes, Oceans, Water pollution, Analytical techniques, *Radiochemical analysis, Pollutant identification, Water pollution sources.
Identifiers: 90Sr, 137Cs, 144Ce, Marine pollution.

The behavior of artificial radionuclides in seawater has been shown to differ from the behavior of natural isotopes, at least within a duration of time after the artificial substances have been introduced into the sea. The physico-chemical states of artificial radionuclides 90Sr, 137Cs, and 144Ce in seawater were studied by radio-chemical analysis of filtered and unfiltered seawater, in order to understand and predict the radioactive contamination of the marine environment. These fallout radionuclides were analyzed, and the difference of radionuclide concentrations between unfiltered and filtered seawater was defined as the particulate form radioisotope. A considerable amount of 144Ce was found to be particulate. Almost no 90Sr greater than 0.22 microns in size was observed in either coastal or open seawaters, but much 137Cs seemed to be insoluble in coastal waters. For the Kashima-nada area, the possible occurence of particulate radionuclides greater than 0.22 microns in size was estimated, and was found to one percent or less for 90Sr and 6 percent for 137Cs. In coastal water, 80 percent of 144Ce were in particulate form, but very little particulate 144Ce was found in the open seawater. The influence of suspended matter to 137Cs and 144Ce concentration levels in seawater is as yet undetermined. (Prague-FIRL)
W75-11022

MERCURY CONTENT OF WHALES, (IN JAPANESE),
K. Nagakura, S. Arima, M. Kurihara, T. Koga, and T. Fujita.
Bulletin of the Tokai Regional Fisheries Laboratory, No 78, p 41-46, June 1974. 7 tab, 5 ref.

Descriptors: Aquatic animals, *Heavy metals, *Mercury, *Animal physiology, Path of pollutants, Food chains, Environmental effects, Water pollution effects.
Identifiers: *Whales, Fin whale, Sei whale, Sperm whale, Balaenoptera physalus, Balaenoptera borealis, Physeter catoden, *Methyl mercury, Bioaccumulation, Tissue analysis.

The mercury content of the meat of fin whale, Balaenoptera physalus, sei whale, B. borealis, and sperm whale, Physeter catoden, was determined. Total mercury content of the sei and fin whales (baleen whales) was 0.01-0.07 ppm and 0.01 - 0.03 ppm, respectively; methyl mercury content was

less than 0.008 ppm. Total mercury content of sperm whale, a toothed whale, was 0.65-1.57 ppm in North Pacific and 0.54-1.48 ppm in Antarctic samples, of which 70% in both areas was methyl mercury. The variance in mercury content was ascribed to the difference in feeding habits of the two whale types. (Katz)
W75-11029

COPPER TOXICITY IN BUSYCON CANALICULATUM L.,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W75-11031

PRELIMINARY INVESTIGATIONS INTO COPPER CYCLING IN INDIAN LAKE, MASSACHUSETTS: A LAKE TREATED ANNUALLY WITH COPPER SULFATE,
Massachusetts Univ., Amherst. Water Resources Research Center.
K. H. Symmes.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 716, $3.75 in paper copy, $2.25 in microfiche. Publication No 47, Completion Report FY-75-2, April 1975. 37 p, 9 fig, 6 tab, 28 ref. OWRT A-064-MASS(1). 14-31-0001-4021.

Descriptors: Copper, *Massachusetts, Lakes, Water treatment, *Copper sulfate, *Eutrophication, *Water pollution treatment, *Path of pollutants, Metals, Absorption, Lake sediments, Biota.
Identifiers: *Indian Lake(Mass), Macrophytes.

Indian Lake is a shallow, soft-water, eutrophic lake located within the city limits of Worcester, Mass. Its watershed is well-developed and since the early 1960's the lake has suffered from severe algal blooms. Copper sulfates has been applied each summer since then to control the problem. This study was undertaken to provide knowledge of copper concentrations and cycling in a treated lake. Copper inputs to Indian Lake included an estimated 14 kg soluble and 18 kg particulate copper from the watershed between Aug. 6, 1973, and Jan. 16, 1974, and 345 kg soluble from copper sulfate treatment during July and Aug. 1973. Less than 2% of the total copper input left the system through the lake outlet, approximately 2% was present in soluble and particulate form in the water column at any given time, and the remainder was incorporated into Indian Lake sediments and biota. The application of copper sulfate to Indian Lake was followed by rapid conversion of soluble copper to particulate forms which were deposited on the lake bottom. Conversion and deposition were approximately 90% complete by the 10th day following treatment. Although resuspension of bottom sediments did occur, release of copper to the water column from circulating sediments was apparently not extensive. Macrophytes in the shallow south basin of Indian Lake absorbed copper from the water following the application of copper sulfate. Subsequent declining copper concentrations in the plants may have been due to release of copper back into the water, but large increases in copper in the water adjacent to the plants during the period of declining plant copper concentrations were not observed.
W75-11039

HYDRAULIC MODELING OF MIXING PHENOMENA IN STRATIFIED LAKES,
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 2H.
W75-11043

BIOCHROME ANALYSIS AS A METHOD FOR ASSESSING PHYTOPLANKTON DYNAMICS, PHASE II,
Arkansas Univ., Fayetteville. Dept. of Botany and Bacteriology.
For primary bibliographic entry see Field 5C.
W75-11052

PROCESS STUDIES AND MODELING OF SELF-CLEANING CAPACITY OF MOUNTAIN CREEKS FOR RECREATION PLANNING AND MANAGEMENT,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
C-L. Chen, and K. D. Davis.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 690, $4.25 in paper copy, $2.25 in microfiche. Utah Water Research Laboratory, Logan, Report PRWG135-1, June 1975. 79 p, 5 fig, 5 tab, 36 ref, 2 append. OWRT B-095-UTAH(1), 14-31-0001-4132.

Descriptors: *Dispersion, *Dissolved oxygen, Mathematical models, Mixing, *Reaeration, Turbulence, *Self-purification, Recreation, Planning, Management, Streams, *Utah, Model studies, Tracers, Dye dispersion, *Path of pollutants.
Identifiers: Summit Creek(Utah), Mountain creeks.

Reaeration process studies were conducted on a mountain creek and a large laboratory flume. The method of evaluating the dispersion coefficient, mean velocity, and reaeration coefficient for both creek and flume consisted of finding these values for a deoxygenated portion of the flow containing a conservative tracer (dye). The deoxygenated slug is measured as it moves downstream and the three values are best fit in the analytical solution of the longitudinal dispersion equation which dynamically describes the flow of the dispersing slug in the stream. The best fit was accomplished by using the method of least squares in which the sum of squares of the differences between the dissolved oxygen and dye concentrations calculated from the dispersion equation and those obtained from the actual measurements is minimized. A reaeration coefficient prediction model of general form was developed. The model is composed of two dimensionless parameters which were identified from the normalized dissolved-oxygen balance equation. A simplified model which has two model parameters was also developed. Both model parameters were evaluated specifically for the mountain creek and laboratory flume. A comparison of this simplified model with existing models revealed that most existing models are incomplete in form. Inclusion of the dispersion coefficient in the reaeration coefficient model improved the prediction accuracy. The information obtained from this study would aid in the determining of oxygen balance of mountain creeks which is essential to the resource management of mountain watersheds.
W75-11055

A REEVALUATION OF THE COMBINED EFFECTS OF TEMPERATURE AND SALINITY ON SURVIVAL AND GROWTH OF BIVALVE LARVAE USING RESPONSE SURFACE TECHNIQUES,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5C.
W75-11081

STANDARD CURVES FOR NUVACRON, MALATHION, SEVIN, DDT, AND KELTHANE TESTED AGAINST THE MOSQUITO CULEX PIPIENS L. AND THE MICROCRUSTACEAN DAPHNIA MAGNA STRAUS,
Alexandria Univ. (Egypt). Faculty of Agriculture.
I. A. Rawash, I. A. Gaaboub, F. M. El-Gayar, and A. Y. El-Shazli.
Toxicology, Vol 4, No 2, p 133-144, May 1975. 8 fig, 2 tab, 7 ref.

Descriptors: *Pesticides, *Insecticides, *DDT, Daphnia, *Mosquitos, *Growth stages, *Bioassay, *Toxicity, *Mortality, Methodology, Laboratory tests, Water pollution sources, Mature growth stage, Water pollution effects.
Identifiers: Sevin, Malathion, Nuvacron, Kelthane, Standard log concentration-probit, LC-P, LC-50, *Daphnia magna, *Culex pipiens, Bioaccumulation, Fourth instar.

The fourth instar larvae of the mosquito Culex pipiens and adults of microcrustacean Daphnia magna were used as bioassay test organisms for the preparation of the standard log concentration-probit (lc-p) regression lines for five pesticides-nuvacron, malathion, sevin, DDT, and kelthane. The LC50's indicated that Daphnia magna was far more sensitive than C. pipiens to all five pesticides. (Katz)
W75-11082

THE ACCUMULATION OF CADMIUM, COPPER, MANGANESE AND ZINC BY FUCUS VESICULOSUS IN THE BRISTOL CHANNEL,
Institute for Marine Environmental Research, Plymouth (England).
A. W. Morris, and A. J. Bale.
Estuarine and Coastal Marine Science, Vol 3, No 2, p 153-164, April 1975. 7 fig, 3 tab, 13 ref.

Descriptors: *Phaeophyta, *Metals, *Copper, *Zinc, *Cadmium, *Manganese, *Primary productivity, Plant physiology, Sampling, Laboratory tests, Path of pollutants, Environmental effects, Absorption, Water pollution effects.
Identifiers: *Fucus vesiculosus, Bioaccumulation, Tissue analysis, Bristol Channel(UK).

Comparison of the cadmium, copper and zinc contents of brown algae, Fucus vesiculosus at various sites in the Bristol Channel, with a detailed investigation of dissolved trace metal concentrations to which they are subjected, demonstrated a passive nature of accumulation. Consistent concentration factors had been obtained over a range of mean ambient dissolved concentrations of these metals. In contrast, manganese accumulation appeared to be partially regulated. (Katz)
W75-11083

ABSORPTION AND ELIMINATION OF PHOTODIELDRIN BY DAPHNIA AND GOLDFISH,
Illinois Univ., Chicago. Dept. of Biological Sciences.
H. M. Khan, S. Neudorf, and M. A. Q. Khan.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 5, p 582-587, May 1975. 3 fig, 1 tab, 14 ref.

Descriptors: *Daphnia, Freshwater fish, *Insecticides, Algae, *Dieldrin, *Organic pesticides, *Absorption, Plankton, Analytical techniques, Photometry, Food chains, Path of pollutants, Laboratory tests.
Identifiers: Ankistrodesmus spiralis, *Goldfish, Carassius auratus, Elimination, *Photodieldrin, Decontamination, Bioaccumulation.

The alga, Ankistrodesmus spiralis, became saturated with photodieldrin in 8 hours. Daphnia eliminated 50% of the absorbed photodieldrin in 4 days which increased up to 70% in 7 days. Continuous exposure of daphnids to photodieldrin resulted in increased absorption and accumulation of the insecticide. Transfer of contaminated goldfish, Carassius auratus, to clean water resulted in initial elimination in 24 hours whose rate was subsequently reduced. (Katz)
W75-11085

UPTAKE OF CADMIUM, ZINC, COPPER, LEAD AND CHROMIUM IN THE PACIFIC

OYSTER, CRASSOSTREA GIGAS, GROWN IN THE TAMAR RIVER, TASMANIA,
Tasmanian Dept. of the Environment, Hobart (Australia).
G. M. Ayling.
Water Research, Vol 8, No 10, p 729-738, October 1974. 4 fig, 7 map, 1 tab, 13 ref.

Descriptors: *Oysters, *Metals, *Cadmium, *Zinc, *Copper, *Lead, *Chromium, *Mud, *Bioassay, Food chains, Animal physiology, Water pollution, Laboratory tests, Path of pollutants, Shellfish farming.
Identifiers: *Pacific oyster, *Crassostrea gigas, *Bioaccumulation, *Tissue analysis, Tamar River(Tasmania).

Pacific oysters (Crassostrea gigas) and mud samples from the Tamar River were analyzed for copper, cadmium, zinc, lead and chromium. Concentrations of cadmium, zinc and copper found in oysters were 10-40 times the concentrations in inhabited muds. Copper and chromium appeared to be absorbed up to a weight limited by oyster size and was independent of metal concentration in the mud. Lead was not absorbed through any physiological demand, but was randomly incorporated at sites containing high concentrations in the mud. Zinc and cadmium were accumulated dependent on their concentrations in the mud. The concentrations of zinc and cadmium in muds may be used to indicate whether a site is grossly unsuited for the culture of oysters. (Katz)
W75-11086

STUDIES ON THE INORGANIC COMPONENTS OF MARINE ANIMALS-III, ON THE CONTENTS OF CADMIUM, ZINC, COPPER, LEAD AND IRON IN MUSCLE AND VISCERA OF MARINE ANIMALS CAPTURED IN THE WEST SEA AREA OF KYUSHU, (IN JAPANESE),
Nagasaki Univ. (Japan).
For primary bibliographic entry see Field 5C.
W75-11087

THE USE OF SNAKES AS A POLLUTION INDICATOR SPECIES,
Mesa Coll., Grand Junction, Colo. Dept. of Biological Sciences.
B. Bauerle.
Copeia, No 2, p 366-368, 1975. 1 tab, 2 ref.

Descriptors: *Snakes, *Chlorinated hydrocarbon pesticides, *Lead, *Path of pollutants, Animal physiology, DDT, DDE, Dieldrin, Metals, Laboratory tests, Environmental effects, Pollutant identification, *Bioindicators.
Identifiers: *Gopher snakes, Pituophis catenifer, *Prairie rattlesnakes, Crotalus viridis, Bioaccumulation, Tissue analysis, Beta-benzene hexachloride, Heptachlor epoxide.

Male gopher snakes, Pituophis catenifer, and prairie rattlesnakes, Crotalus viridis, were analyzed for 36 herbicides, pesticides, organophosphates, and lead in an ecosystem where these substances have seldom, if ever, been applied. The snakes sampled had low levels of chlorinated hydrocarbons in their adipose tissue and low levels of lead in their livers. The most common chlorinated hydrocarbons found included DDE, DDT, dieldrin, beta-benzene hexachloride and heptachlor epoxide. (Katz)
W75-11089

A MATHEMATICAL MODEL FOR OPTIMAL WASTE LOAD ALLOCATIONS,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 5G.
W75-11102

THE WATER QUALITY AND BOTTOM SEDIMENT CHARACTERISTICS OF NEW JERSEY LAGOON DEVELOPMENTS,
Rutgers - the State Univ., New Brunswick, N.J.
E. H. Thurlow.
Available from University Microfilms, Inc., Ann Arbor, Mich, 48106. Order No 75-8450. PhD Thesis, 1974, 360 p.

Descriptors: *Waste disposal, *Lagoons, *Sewage, *Water quality control, *New Jersey, Heavy metals, Sedimentation, Pollutant identification, Water pollution sources.
Identifiers: Bottom sediments.

A three year study of four lagoon developments near Ocean County, New Jersey, was conducted to determine the nature of the water and bottom sediments, and the effects of types of waste disposal systems. It was found that each lagoon development had its own characteristic channel arrangement, amount and type of fresh water input, and inland penetration. Depth was a major factor influencing water quality; depths within and between lagoon systems were variable. Because lagoon areas are usually deeper than the adjacent bay, there was a hindering of water exchange and stagnant conditions are created in the bottom waters. As the shallowest area of the lagoon is usually at the mouth, the deeper remote points tended to be slightly more polluted due to depth, fresh water input, or poor water circulation. NH4(N), NO3(N), NO2(N), PO4, Cl, SO4, and some heavy metals, as well as anaerobic conditions were found accumulated in very deep lagoon areas. Lagoon sediments tended to be high in organic matter, total nitrogen content, CEC, and exchangeable cations, and to be black musks with H2S odors. An increase in population had an adverse effect on both the water quality and bottom sediments through increased addition of pollutants and organic materials from sewage, homes, and boats. Water quality in unsewered lagoons was better than quality of water in sewered lagoons, but bottom sediments of each were similar. (Prague-FIRL)
W75-11104

ENDEMIC NEPHROPHATHY AND ITS RELATION TO THE CONTAMINATION OF WELL WATER BY PHENOLIC COMPOUNDS IN BARSA-ARAD (NEFROPATIA ENDEMICA SI RELATIA CU IMPURIFICAREA PRIN COMPOUSI FENOLICI IN APELE FINTINILOR DIN COMUNA BARSA-ARAD),
N. Mustata, and S. Matei.
Clujul Medical, Vol 47, No 3, p 543-547, 1974. 2 tab, 8 ref.

Descriptors: *Public health, *Water supply, *Phenols, *Potable water, Wells, Human pathology, Mortality, Water pollution sources, Water pollution effects, Water wells.
Identifiers: *Endemic nephropathy, *Romania(Barsa-Arad).

Phenolic compounds were found in the water of wells in the commune of Barsa-Arad. Eleven persons died after drinking this water and 9 other persons were ill with endemic nephropathy. The concentrations of phenolics varied between 28 and 203 gamma/liter. The concentration levels were found to be distributed in three rows at the base of the ground level elevation existing in this locality of the bank of the Morilor channel. A similarity was determined to exist between the peculiarities of contamination with phenolic compounds in the Barsa-Arad region and of other zones of endemic nephropathy in the Secaseni (Caras-Severin District) and Strehaia (Mehedinti District) of Romania. (Orr-FIRL)
W75-11105

LIMITATIONS OF USING A SIMULATION MODEL OF THE SOIL UNDER IRRIGATED CULTIVATION TO SIMULATE THE FUNCTIONING OF THE SOIL AS A PURIFYING SYSTEM (LIMITES D'UTILISATION D'UN MODELE DE COMPORTEMENT DU SOL SOUS CULTURE IRRIGUEE POUR SIMULER LE FONCTIONNMENT DU SOL COMME SYSTEME EPURATEUR),
Institut National de la Recherche Agronomique, Versailles (France). Soils Lab.
P. Graffin.
Annales Agronomiques, Vol 25, No 2/3, p 157-177, 1974. 4 fig, 14 ref.

Descriptors: *Model studies, *Simulation analysis, Irrigated land, Land use, Drainage, Soil water, Groundwater, Waste disposal, Waste water treatment, Water reuse.
Identifiers: *Land disposal.

The use of a simulation model of the soil under irrigated cultivation was aimed at forecasting the results of organic wastes purification by the soil and subsequent environmental effects. Researchers in the United States considered such a model, combining the dependent factors of: water circulation in non-saturating conditions; ionic exchanges between the solid phase and liquid phase; displacement of soluble elements; transformation of organic matter in aerobic conditions; and water and nitrate absorption by plants. This DUTT model is not applicable for general waste spreading on land or for conditions involving evolution in an anaerobic medium. The model is, however, useful for land application of wastes under classical agricultural practices involving moderate quantities of organic matter. Composition of the drainage water as well as any changes in soil composition, are central variables in programming this model. (Prague-FIRL)
W75-11125

DRUG RESISTANT COLIFORMS CALL FOR RE-EVALUATION OF WATER QUALITY STANDARDS,
National Inst. for Water Research, Pretoria (South Africa).
W. O. K. Grabow, O. W. Prozesky, and L. S. Smith.
Water Pollution Control, Vol 74, No 2, p 217-224, 1975. 1 tab, 120 ref.

Descriptors: *Coliforms, *Sewage bacteria, Pathogenic bacteria, *Water quality standards, Sewage treatment, Enteric bacteria, Public health, E. coli, Water pollution sources.
Identifiers: *Drug resistant bacteria, *R factor.

Evidence is presented to support the idea that water polluted with coliform and other bacteria generally considered as non-pathogenic contributes to the incidence of drug resistance among bacteria involved in disease. Resistance to drugs is imparted by chromosomal resistance and by resistance (R) factors. R factors are extrachromosomal nucleic acid elements (plasmids) which replicate autonomously. R factors are transmissible among Gram negative bacteria such as enterobacteria including E. coli, Salmonella typhi and Shigella dysenteriae. Ingestion of bacteria carrying R factors (R+ bacteria) can result in the transfer of these factors to the normal intestinal flora. These organisms then act as a reservoir of resistance which they may transfer to sensitive bacteria involved in disease. The two factors which are involved in the spread of R+ bacteria are drug resistance which selects for resistance plasmids and the transmission of these organisms from excretors to the rest of the population through sewage. Two percent of the coliforms in sewage and in sewage polluted water can be expected to carry R factors (maximum 26% in a hospital effluent). Current water quality standards regard coliforms as purely indicators of fecal pollution. However, since plasmid infected coliforms have been shown to be joined with bacteria increasingly involved in disease, they can no longer be regarded as harmless. This necessitates a re-evaluation of quantitative and qualitative water criteria as well as increasing the list of reasons for more advanced sewage treatment. (Orr-FIRL)
W75-11130

SOUTH AFRICAN EUTROPHICATION PROBLEMS: A PERSPECTIVE,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5C.
W75-11131

A NEW LOOK AT POLLUTION PREVENTION ON LOWLAND RIVERS,
Thames Water Authority, London (England).
For primary bibliographic entry see Field 5G.
W75-11132

DESIGN OF THE OPTIMAL OUTFALL SYSTEM FOR A STREAM RECEIVING THERMAL AND ORGANIC WASTE DISCHARGES,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
S. H. Lin, L. T. Fan, and C. L. Hwang.
Water Research, Vol 9, No 7, p 623-630, July 1975. 12 fig, 1 tab, 17 ref. OWRT B-037-KAN(2).

Descriptors: *Outlets, *Sewers, *Cooling water, Outfall sewers, Computer models, Model studies, Water temperature, Biochemical oxygen demand, Dissolved oxygen, Drainage systems, Streams, Water quality, Water cooling, Discharge(Water), Heated water, Aeration, Water pollution sources, Water pollution, Waste assimilative capacity, Thermal pollution, Organic wastes, Temperature, Design, Design criteria.

A system synthesis technique was employed for selecting the 'best' outfall configuration for a stream that receives multiple thermal and organic waste discharges. The optimal locations for the cooling water and organic waste discharges, the optimal allocations of the wastes to these discharge points, and the optimal artificial aeration control policies were simultaneously determined. A dual water quality constraint on the minimum DO concentration and the maximum BOD concentration was imposed in order to ensure that the water quality be maintained above a minimum legal requirement. The complex pattern search method along with the modified algorithm of the maximum principle was used to generate the required information. A specific example of double-outfall system was solved to illustrate the theoretical development. (Sims-ISWS)
W75-11137

WATER POLLUTION FROM NONPOINT SOURCES,
Midwest Research Inst., Kansas City, Mo.
A. D. McElroy, S. Y. Chiu, J. W. Nebgen, A. Aleti, and A. E. Vandegrift.
Water Research, Vol 9, No 7, p 675-681, July 1975. 3 tab, 18 ref.

Descriptors: *Water pollution sources, *Pollutants, *Water pollution, *United States, Sediments, Mine wastes, Acid mine water, Salinity, Heavy metals, Nutrients, Fertilizers, Pesticides, Agriculture, Mining, Forest management, Construction, Organic wastes, Water quality.
Identifiers: *Non-point pollutant sources.

Nonpoint pollutant sources exert a significant influence on water quality in the United States. Based on land use data, more than 97% of the land area in the U.S. is a potential source of nonpoint pollution. Important pollutants are sediment, nutrients, pesticides, organic wastes, thermal discharges, acid mine drainage, salinity, radioactivity, microbial pollutants, and heavy metals. Agriculture, especially cropland, is responsible for the release of large quantities of sediment, nutrients, and pesticides. Because of the production of large quantities of organic wastes from livestock operations, these wastes can be potential source of water quality degradation, if not handled properly. Silviculture is a source of sediment. Other pollutants originating from silvicultural operations include very limited quantities of nutrients, pesticides, and thermal discharges. Surface mining is a major source of erosion sediment. Acid mine drainage, salinity, and heavy metals are other important pollutants from mining. Sediment is a major pollutant from construction industry. (Sims-ISWS)
W75-11158

DISSOLVED GAS SUPERSATURATION AND DILUTION IN THERMAL PLUMES FROM STEAM ELECTRIC GENERATING STATIONS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
G. F. Lee, and P. H. Martin.
Water Research, Vol 9, No 7, p 643-648, July 1975. 2 tab, 9 ref.

Descriptors: *Supersaturation, *Gases, *Cooling water, *Powerplants, Nitrogen, Oxygen, Waste dilution, Discharge(Water), Thermal powerplants, Nuclear powerplants, Electric powerplants, Fish, On-site investigations, Water pollution, Velocity, Heated water, *Thermal pollution.

The use of natural waters for waste heat dissipation for steam electric generating stations using once-through cooling creates potential problems of dissolved gas supersaturation in the thermal discharge plume for fish that can reside in the plume. Computations were presented which show the amount of dissolved gas supersaturation that would be expected in thermal discharge plumes employing offshore high velocity discharge and onshore low velocity discharge. It was predicted that dissolved gas supersaturation problems would be rare for steam electric generating stations utilizing high velocity offshore discharge for cooling water/heat dissipation because of the rapid dilution that occurs in the discharge plume. However, problems of this type would be expected for low velocity discharges. It was also shown that the rate of dilution from high velocity discharges would tend to minimize the environmental impact of chemicals (such as chlorine) used for condenser fouling control. (Sims-ISWS)
W75-11159

BEHAVIOR OF MN, FE, CU, ZN, CD AND PB DISCHARGED FROM A WASTEWATER TREATMENT PLANT INTO AN ESTUARINE ENVIRONMENT,
Maryland Univ., College Park. Dept. of Chemistry.
G. R. Helz, R. J. Huggett, and J. M. Hill.
Water Research, Vol 9, No 7, p 631-636, July 1975. 6 fig, 1 tab, 23 ref. NSF Grant GI-38973.

Descriptors: *Trace elements, *Metals, *Water pollution, *Estuaries, *Maryland, Manganese, Iron, Copper, Zinc, Cadmium, Lead, Heavy metals, Pollutants, Sampling, Chemical analysis, Water pollution sources, Wastes, Sewage effluents, Sediments, Path of pollutants.
Identifiers: *Back River(Md).

To obtain information on the fate of trace metals discharged to an estuarine environment, analyses were made on water and sediment samples from Back River, Maryland, and on effluent from the large wastewater treatment plant that discharges there. Within 2-3 km of the outfall, the concentration (in micrograms/liter) of all metals decreases as follows: Mn, greater than 120-90; Fe, greater than 570-300; Cu, 53-7; Zn, 280-9; Cd, 3.5-0.5 and Pb, 31- less than 4. Except possibly for Mn and Fe, these decreases are much greater than can be ascribed to simple dilution, so physical, chemical or biological processes must be removing metals to the sediments. Correspondingly, sediment concentrations of Cu, Zn, Cd, and Pb are approximately one order of magnitude higher than normally found in uncontaminated areas. After the initial decrease, concentrations of Mn and Cd in the water begin to rise again, suggesting remobilization from the sediments. Comparison of the estimated annual discharge of 8 trace metals to the Chesapeake Bay from wastewater treatment plants and from rivers suggests that the wastewater input may be within one order of magnitude of the fluvial input for Cr, Cu, Zn, Cd, and Pb. Of the metals studied, Cd presents the greatest potential for serious pollution because its input from wastewater probably exceeds fluvial input, it appears to be readily remobilized from sediments, and it is known to be toxic to many organisms. (Sims-ISWS)
W75-11160

EVIDENCE OF ATMOSPHERIC TRANSPORT OF OZONE INTO URBAN AREAS,
New York State Dept. of Environmental Conservation, Albany. Div. of Air Resources.
For primary bibliographic entry see Field 5A.
W75-11169

MUTAGENS AND POTENTIAL MUTAGENS IN THE BIOSPHERE: I. DDT AND ITS METABOLITES, POLYCHLORINATED BIPHENYLS, CHLORODIOXINS, POLYCYCLIC AROMATIC HYDROCARBONS, HALOETHERS,
National Center for Toxicological Research, Jefferson, Ark.
L. Fishbein.
Sci Total Environ, Vol 2, No 4, p 305-340, 1974. Illus.

Descriptors: *DDT, *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, Distribution, Path of pollutants, Reviews, Toxicity.
Identifiers: Aromatic hydrocarbons, Biosphere, Chlorodioxins, Ethers, Metabolites, *Mutagens, Toxicology.

For proper assessment of actual risks, the interactions between different modes of administration of a toxicant must be understood and the probable impingement of the environmental substances upon the various portals of entry must be known. To best understand this last requirement we must know how the toxicants in question are distributed in and are transported through the environment to finally impact on man. In this review, a small number of mutagens and potential mutagens (e.g., DDT and its metabolites, polychlorinated biphenyls, chlorinated dioxins, polycyclic aromatic hydrocarbons and haloethers) are evaluated in terms of their occurrence, use patterns, distributions and impact in the environment. In many cases the information is fragmentary; e.g., patterns of region and local variation of the toxicants have been only superficially investigated and the detailed pathways of residues within the trophic networks are poorly understood. The physiological and ecological effects of the toxicants at sublethal levels are also to a large extent unknown. More information is needed as to the production (nature of reactants, amounts, reactivity, disposal, etc.), import and export data for specific potential environmental toxicants, the nature and routes of their global transport, and the concentration, longevity, biochemical and toxicological activity of their residues (including specific chemical nature) that occur in their various biosphere compartments including air, water, soil, and biota. (See also W75-11171)--Copyright 1974, Biological Abstracts, Inc.
W75-11170

MUTAGENS AND POTENTIAL MUTAGENS IN THE BIOSPHERE: II. METALS--MERCURY, LEAD, CADMIUM AND TIN,
National Center for Toxicological Research, Jefferson, Ark.
L. Fishbein.
Sci Total Environ, Vol 2, No 4, p 341-371, 1974.

Descriptors: Metals, Heavy metals, *Mercury, *Lead, Cadmium, Reviews, Toxicity, Distribution, Path of pollutants, Environmental effects.
Identifiers: *Biosphere, *Mutagens, Tin, Toxicology.

Comparative data (wherever available) are presented on the amounts and residues in the environment of a small number of mutagenic and potentially mutagenic metals focussing on Hg, Pb, Cd and Sn (and their principal derivatives). Primary consideration is given to aspects of their production and/or occurrence, reactivity, disposal, concentration, transfer, longevity, biochemical and toxicological nature of their residues in the various biosphere compartments. (See also W75-11170)--Copyright 1974, Biological Abstracts, Inc.
W75-11171

DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED FOR WATER MILFOIL CONTROL IN LARGE RESERVOIRS,
Tennessee Valley Authority, Muscle Shoals, Ala.
W. W. Barnes.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 37-41, August 1974.

Descriptors: *Monitoring, *Aquatic weed control, *2-4-D, *Bioassay, *Pesticide residues, *Tennessee Valley Authority, Tennessee River, Benthos, Clams, Mussels, Insects, Rates of application, Bottom sediments, Fish, Potable water, Tennessee, Alabama, Reservoirs.
Identifiers: Water milfoil.

Eurasian water milfoil in seven TVA reservoirs from Melton Hill in east Tennessee to Wilson Dam north Alabama was treated with 2,4-D butoxyethanol ester. 2,4-D did not depress benthic insects (especially Hexagenia nymphs), clams, and mussels, but milfoil eradication eliminated substrates for epiphytic insects (immature midges, mayflies, and dragonflies). Forty percent of samples of mud, fish, milfoil, mussels, and Asiatic clams contained less than 0.10 ppm of 2,4-D residues; fish showed little uptake, mussels some, and some mud samples contained significant concentrations for 10 months. Net tests showed that 40-100 pounds 2,4-D per acre caused some movement of fish from treated areas, but there were no distressed or dead native fish. Laboratory tests indicated that complete control of milfoil can be obtained with exposures of 3 ppm 2,4-D for 5 hours, 1 ppm for 48 hours, or 0.1 ppm for about 30 days. A sensitive bioassay technique for measuring 2,4-D residues in reservoirs was developed. Following treatment with granular 2,4-D, 2,4-D residues were initially high at the water surface, then decreased. The rate of decrease depended on the degree of dilution by water movement. Water treatment plants along the Tennessee River system were monitored for 2,4-D residues using carbon filters. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11198

DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED TO THE WATERSHED,
Oregon State Univ., Corvallis. School of Forestry.
L. E. Norris.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p E5-E12, August 1974. 5 tab, 6 ref.

Descriptors: *Pesticide residues, *Weed control, *Watersheds(Basins), *Vegetation, *Oregon, Herbicides, 2-4-D, 2-4-5-T, Path of pollutants, Leaching, Persistence, Surface runoff, Streams, Forests.
Identifiers: Cascade Creek Watershed(Ore), Eddyville Watershed(Ore), Malheur National Forest(Ore), Terrestrial vegetation.

Spray projects in Oregon illustrate application methods to minimize residues of phenoxy herbicides in streams and runoff. When the Cascade Creek Watershed was sprayed with 2,4,5-T and the Eddyville Watershed and Malheur National Forest were treated with 2,4-D, there was usually a short period of contamination. The magnitude of contamination was not a function of the herbicide or geographical location, but was closely related to the manner in which the treatment area was laid out with respect to live streams. When spray boundaries were close to, but did not include, live streams, downstream herbicide concentrations were low and persisted for only a short time. When there was standing water and a high water table, high concentrations of herbicides were found shortly after application and persisted for long periods of time. Leaching and surface runoff can move chemicals from deposit areas to streams. Surface flow can carry large amounts of chemicals long distances in a short time. This rarely occurs in western forests since the infiltration capacity of the forest floor and soil is much larger than the precipitation. Most pesticide residues enter the soil where absorption prevents their movement. Leaching is slow and moves only small amounts of herbicide short distances. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11213

DISSIPATION OF PHENOXY HERBICIDES APPLIED TO RIPARIAN VEGETATION,
Pennsylvania State Univ., University Park. School of Forestry.
W. E. Sopper.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p E13-E16, August 1974.

Descriptors: *Herbicides, *Pesticide residues, *Riparian plants, Banks, Brush control, Spraying, Streams, Watershed management, Watersheds(Basins), *New Jersey, *Pennsylvania, 2-4-D, 2-4-5-T, Vegetation, Potable water, Rates of application.

To determine the extent of streamflow contamination following the spraying of riparian vegetation with phenoxy herbicides, the banks of small headwater streams of the Newark, New Jersey watershed and Stone Valley Experimental Forest in Pennsylvania were sprayed with a 2,4,5-T ester or emulsifiable acid during a low streamflow period (flow less than 0.1 cfs (45 gpm)). During the three weeks after treatment, odor contamination was only observed in the treated reach of the stream immediately after spraying and after the first large storm. No contamination was found downstream. The ester formulation had completely killed 70-81% of the brush stems, and the emulsifiable acid had killed 58-78%. From 17-32% of the remaining stems were partially killed. A subsequent treatment in 3-5 years should eliminate the remaining stems. New streambank vegetation was primarily grasses and herbaceous species which should eventually predominate. Phenoxy herbicides can therefore be used to control riparian vegetation on municipal watersheds if properly applied with normal precautions. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11214

CHELATION STUDY OF COPPER (II): FULVIC ACID SYSTEM,
Canada Centre for Inland Waters, Burlington (Ontario).
V. Cheam.
Canadian Journal of Soil Science, Vol 53, No 4, p 377-382, 1973. 2 fig, 1 tab, 29 ref.

Descriptors: Analytical techniques, *Humic acids, *Chelation, *Fulvic acids, *Copper, *Volumetric analysis, Electrodes, Chemical reactions, Organic acids, Ions, Chemical analysis, *Pollutant identification, *Water pollution.

Complexing of humic compounds was studied using an ion-selective electrode. Chelation between copper ion and fulvic acid using a solid-state electrode reversible to this ion occurred at the salicyclic acid-like bidentate sites of fulvic acid, which consists of phenolic hydroxyl groups ortho to ionized carboxyl groups. The mass action quotient (equilibrium quotient) varied with pH and mole fractions less than 0.3. The pH 3 curve of copper-fulvic acid chelation leveled off at mole fractions of 0.3-0.7, indicating that the equilibrium constant does not depend on reactant concentrations; this is consistent with the assumption that the chelate is a 1:1 type complex. In this composition range the best mass action quotient value is 2.2. Assuming that the pH 4 and 5 curves behave similarly in this mole fraction range, the mass action quotients would be about 0.6 and 0.25, respectively. Under these conditions fulvic acid appeared to be a stronger chelating agent than salicyclic acid. Higher complexes may exist when the mole fraction is smaller than 0.3. Under conditions found in natural lake waters, copper is probably strongly bonded to fulvic acid. Other trace elements may act in a similar way toward fulvic acid and humic substances. (Buchanan-Davidson--Wisconsin)
W75-11219

SEDIMENT PROCESSES IN GREAT LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W75-11237

THE UTILIZATION OF SUN-GLINT IN A STUDY OF LAKE DYNAMICS,
Canada Centre for Inland Waters, Burlington(Ontario).
For primary bibliographic entry see Field 5A.
W75-11239

PRELIMINARY INFORMATION ON THE NATURE OF ORGANIC MATTER IN THE SURFACE SEDIMENTS OF LAKES HURON, ERIE, AND ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W75-11240

CHANGES IN VEGETATION AND SURFACE SOIL PROPERTIES FOLLOWING IRRIGATION OF WOODLANDS WITH MUNICIPAL WASTEWATER,
Michigan State Univ., East Lansing. Dept. of Forestry.
D. P. White, G. Schneider, E. A. Erickson, and D. Urie.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 798, $4.75 in paper copy, $2.25 in microfiche. Completion Report, Institute of Water Research, Michigan State University, East Lansing, August 1975. 76 p, 11 fig, 17 tab, 17 ref. OWRT A-055-MICH(1), 14-31-0001-3522.

Descriptors: *Water reuse, *Waste water treatment, Soil properties, Irrigation, Municipal wastes, Sewage effluents, Soil surfaces, Soil chemistry, *Biodegradation, Nutrients, Water quality, *Humus, *Decomposing organic matter, *Michigan, Forests, Vegetation, Water pollution sources.
Identifiers: Soil water quality, Humus decomposition, Vegetation growth, Red pine forest, Maple-beech hardwood forest.

The impact of municipal wastewater irrigation on soil water quality, Vegetation growth and nutrient status, soil chemistry, and humus decomposition in a 20-year old red pine plantation and maple-beech hardwood forest in southern Michigan was studied. The pine plantation was spray irrigated

with sewage stabilization pond effluent during the summer and early fall of 1972-4. The hardwood forest site received 25, 50 and 75 mm/week of secondary sewage effluent and 50 mm/week of well water through a trickle irrigation system during 1972-3. Observations and measurements were made on water quality; renovation of percolating waters as determined by analysis of samples from suction lysimeters; growth and nutrient status of vegetation; changes in soil chemistry; changes in soil humus and fungi. Recommendations included restriction of irrigation infiltration rates to 3 mm/hour and weekly loadings to 50 mm. Maximization of vegetative growth should be subordinated to maintaining the ecosystem in a viable condition. Toxicity of effluent pollutants such as boron could be a serious threat to certain types of vegetation and may limit the use of pine plantations as potential wastewater disposal sites.
W75-11243

SOLID WASTES, ANIMAL REFUSE, AND ORGANIC RESIDUES DISPOSAL, AND THE QUALITY OF GROUND WATER,
Tuskegee Inst., Ala. School of Applied Sciences.
W. E. Nelson.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 826, $4.25 in paper copy, $2.25 in microfiche. Completion Report, (1975). 66 p, 14 fig, 19 tab, 8 append. OWRT C-3089(No 3732)(1).

Descriptors: Landfills, *Leachate, *Groundwater, Design criteria, Soils, Metals, Trace elements, Granes, Soil types, Water quality, Farm wastes, Solid wastes, Waste disposal, Feed lots, *Path of pollutants, Water pollution sources.
Identifiers: Leachate production, Cover material.

Studies on a field sanitary landfill on a laboratory sanitary landfills, and on an animal feedlot were conducted to correlate the design criteria, field density, temperature and subsidence patterns of the buried wastes, and the vegetative covers with the chemical and ground water pollutional characteristics of the leachates generated by the decomposing wastes. These data were interpreted in relation to the field densities of the compacted refuse, the vegetative covers, time, and the eventual chemical character of leachates after having passed through a prescribed distance of soil in a given time. The results indicate that there are no specific relationships between precipitation, time, and the volume of leachate drained from the lysimeters compacted to two levels of compaction. Leachates were generated only after the buried wastes were saturated which represent a six week lag period during which 5.56 ft of rain fell on the area (or 475.7 liters of rainfall per the 6 ft x 6 ft x 6 ft dimension of each lysimeter, and producing 3.92 milliliters of leachate in the 6th week after burial). The leachates (pH 6.98 - 11.35) had high concentrations of the chemical constituents initially (at the initial soil - solid waste interface) but decreased as more leachate was generated, or as the leachate with any given total concentration passed through the soil. This, with the lowering of the pH (down to pH 6.0) indicates that the soil removes chemical pollutants from the permeating leachates.
W75-11244

ACUTE TOXICITY OF PETROCHEMICAL DRILLING FLUIDS COMPONENTS AND WASTES TO FISH,
Fisheries and Marine Service, Winnipeg (Manitoba). Resource Management Branch.
For primary bibliographic entry see Field 5C.
W75-11265

FERTILIZER PHOSPHATE IN STREAMS AND LAKES,
Canberra Coll. of Advanced Education (Australia).
P. W. Cullen.
In: Fertilizers and the Environment. Proceedings of a Symposium, Wesley College, University of Sydney, May 13-15, 1974. Australian Institute of Agricultural Science (New South Wales Branch), Sydney, p 103-109, 1974. 1 tab, 26 ref.

Descriptors: *Fertilizers, *Phosphorus compounds, *Water pollution effects, *Path of pollutants, Reviews, Leaching, Phosphates, Agriculture, Water pollution sources, Eutrophication.

Studies of the amount and route of fertilizer phosphorus movement from the point of application into natural waters are reviewed. Generally such studies have shown that the leakage of phosphate from treated areas is low in proportion to the amount applied. However, what is considered low as a loss from the agricultural system may be considered substantial as an input to aquatic ecosystems. (CSIRO)
W75-11310

NATURAL AND FERTILIZER NITROGEN IN STREAMS AND LAKES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.
P. Jakobsen.
In: Fertilizers and the Environment. Proceedings of a Symposium Wesley College, University of Sydney, May 13 - 15, 1974. Australian Institute of Agricultural Science, (New South Wales Branch), Sydney, p 53-59, 1974. 47 ref.

Descriptors: *Nitrogen compounds, *Eutrophication, *Fertilizers, *Water pollution effects, *Path of pollutants, Nitrogen cycle, Lakes, Streams, Ecosystems, Reviews.

The major conditions and reactions relevant to the effects of nitrogen in eutrophication are reviewed. These include the major access routes of nitrogen to streams and lakes, accession of ions caused by disruption of ecosystems, characteristics of streams and lakes affecting the occurrence and rate of eutrophication, and the effects of nitrogen loading on aquatic ecosystems as influenced directly by biological and chemical factors and indirectly by environmental constraints. (CSIRO)
W75-11311

BIODEGRADATION OF COMPONENTS OF PULP WASTE EFFLUENTS BY BACTERIA. (I). DEGRADATION OF KRAFT LIGNIN (IN JAPANESE),
Nagoya Univ. (Japan). Faculty of Agriculture.
H. Kawakami, M. Sugiura, and T. Kanda.
Japan Tappi, Vol 29, No 6, p 309-315, June, 1975. 5 fig, 13 ref, 8 tab, English summary.

Descriptors: *Lignins, *Biodegradation, *Pulp wastes, Water pollution sources, Industrial wastes, Wastes, Pseudomonas, Aerobic bacteria, Bacteria, Microorganisms, Aquatic bacteria, Water pollution, Incubation, Decomposing organic matter, Organic compounds, Oxidation, Foreign research, Pine trees, Softwood, Hardwood, Molecular structure.
Identifiers: Beech trees(Fagus), Pseudomonas ovalis, Japan.

The degradation of pine and beech kraft lignin in natural water systems by Pseudomonas ovalis was investigated. After 60-day incubation, pine lignin was much more decomposed than beech lignin. The high-molecular-weight portion of the softwood lignin was appreciably affected and showed a marked increase in carbonyl groups, as well as an extreme decrease in vanillin-producing groups. These groups and syringyl groups decreased only slightly in the hardwood lignin while biphenyl, condensed 5-guaiacyl, and syringyl structures increased upon bacterial decay. Although MeO groups decreased with progressive biodegradation, phenolic and catecholic OH groups decreased also in the residual lignin. On permanganate oxidation, the residual lignin showed increases in p-hydroxyphenyl and 4-methoxyisophthalic acid groups. It appears that Ps. ovalis causes demethoxylation, rather than demethylation of kraft lignins. (Brown-IPC)
W75-11346

5C. Effects Of Pollution

EPIFAUNAL INVERTEBRATES AS INDICATORS OF WATER QUALITY IN SOUTHERN LAKE PONTCHARTAIN,
New Orleans Univ., La. Dept. of Biological Sciences.
M. A. Poirrier, J. S. Rogers, M. A. Mulino, and E. S. Eisenberg.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 533, $4.25 in paper copy, $2.25 in microfiche. Louisiana Water Resources Research Institute, Baton Rouge, Technical Report No 5, May 1975. 43 p, 6 fig, 34 tab, 28 ref. OWRT A-035-LA(1).

Descriptors: Physicochemical properties, Chemical analysis, Bioassay, *Bioindicators, *Invertebrates, *Pollutant identification, Water quality, Estuarine environment, Correlation analysis, Frequency analysis, *Louisiana, Nutrients, Phytoplankton, Primary productivity, Distribution, Eutrophication.
Identifiers: *Lake Pontchartrain(La), *Epifaunal invertebrates.

The distribution and relative abundance of estuarine epifaunal invertebrates can be used to detect water quality differences. Epifaunal invertebrate associations were affected by salinity and storm-water discharge. Differences among both biological and physico-chemical stations were related to discharge of more saline water by the Industrial Canal and quality differences of outfall canal discharge. In 1973 the opening of the Bonnet Carre Spillway added alkaline nutrient-rich, fresh water from the Mississippi River and affected all water quality parameters. Gradual changes occurred as the river water was flushed from the lake. Increased phytoplankton growth resulted from the addition of nutrients. Epifaunal invertebrates were not greatly affected because 26 predominantly estuarine taxa were present 6 weeks after the spillway was closed. Storm-water discharge by outfall canals adds plant nutrients, coliform bacteria and other undesirable substances to the lake. Salinity was lower, but alkalinity, pH and nutrient values were higher due to the spillway opening and heavy rainfall. There was a west-to-east gradient of changing water quality in near-shore stations. Stations near outfall canals in Jefferson Parish had higher nutrient values and lower dissolved oxygen concentration than did similar areas in Orleans Parish. Salinities were higher in Orleans Parish and highest near the Inner Harbor Navigation Canal. Near-shore areas should no be used for recreational activities such as swimming or water skiing because of high concentrations of fecal coliform bacteria.
W75-10852

SOME LIMNOLOGICAL CHARACTERISTICS OF ARIVACA LAKE IN SOUTHERN ARIZONA,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2H.
W75-10891

OIL POLLUTION AND SEABIRDS IN DENMARK 1935-1968,
Game Biology Station, Ronde (Denmark).
A. H. Joensen.
Dan Rev Game Biol. Vol 6, No 8, p 1-24, 1972, Illus.

Descriptors: *Oil pollution, *Birds, Swans, Ducks(Wild), Gulls, Water pollution effects.

Identifiers: Alca-torda, Anas-platyrhynchos, Aythya-fuligula, Clangula-hyemalis, *Denmark, Duck, Fulicaaatra, Melanitta-fusca, Melanitta-nigra, Somateria-molissima, Uria-aalge, *Seabirds.

The number of cases of pollution involving birds increased during the period, but the increase is not so great as the increase in amount of oil transported through Danish waters. Cases of oil pollution occur throughout the year, but great numbers of birds die especially in the 2 coldest months, Jan. and Feb. Throughout the period, most Danish waters were regularly affected by cases of widespread bird mortality. Mortality due to oil mainly affected by spp., which in general are found in the sea far from shore: Somateria mollissima, Melanitta nigra, Melanitta fusca, Clangula hyemalis, Alca torda and Uria aalge. Swans were often reported oiled, but total numbers killed are comparatively small. Other species which occur in Denmark in large numbers confined mostly fresh- and brackish water and areas close to the coasts were seldom reported oiled. This is the case for Anas platyrhynchos and other dabbling ducks, Aythya fuligula, Fulica atra and gulls.--Copyright 1974, Biological Abstracts, Inc.
W75-10893

CONCURRENT NITRIFICATION-DENITRIFICATION AT THE SEDIMENT-WATER INTERFACE AS A MECHANISM FOR NITROGEN LOSSES FROM LAKES,
Wisconsin Univ., Madison. Dept. of Soil Science.
D. R. Keeney, S. Schmidt, and C. Wilkinson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 503, $3.25 in paper copy, $2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS WRC 75-07, August 1975. 21 p, 4 tab, 37 ref. OWRT A-057-WIS(1). 14-31-0001-4050.

Descriptors: *Nitrification, Ammonia, *Denitrification, Interfaces, *Lake sediments, Water quality, Nitrogen, *Sediment-water interfaces, Lakes, Nitrates, *Aeration, Oxidation-reduction potential, *Nutrient removal, Lakes.
Identifiers: Artificial aeration, *Ammonium-nitrogen.

Conditions at the sediment-water interface can, in theory, have a major impact on the nitrogen balance of the lake system. Unless the bottom waters are completely anoxic, nitrification should proceed just above the sediment. If the nitrate thus formed diffuses into the anaerobic sediment, denitrification can occur. The feasibility of nitrification-denitrification at the sediment-water interface and the effect of cyclic artificial aeration on the rate of these aerations were investigated. The approach used was to aerate a model sediment-water system, then cease aeration and allow the system to go anaerobic. This cycle was repeated several times over a 106-day period. Performance was monitored by determination of inorganic N in the water, Eh of the water, and N distribution in the sediment. Aeration of the systems consistently resulted in a decrease in ammonium-N and an increase in nitrate-N in the water and a corresponding rise in Eh to +300 to +380 mV. When the systems were not aerated, nitrate-N and Eh declined, and ammonium-N increased. The sediment remained anaerobic (-220 mV). Pore water ammonium-N and exchangeable ammonium-N in sediment cores taken after the experiment increased with sediment depth, indicating that ammonium-N was released from the sediment to the overlying water. Mass balance calculations indicated a loss of about one-third of the available N in the system. Thus, it is conceivable that nitrification-denitrification by hypolimnion aeration could remove a portion of the N loading of a lake.
W75-10902

GEOCHEMICAL RECONAISSANCE OF SURFICIAL MATERIALS IN THE VICINITY OF SHAWANGUNK MOUNTAIN, NEW YORK,
For primary bibliographic entry see Field 5A.
W75-10928

A WATERBORNE GASTROENTERITIS EPIDEMIC IN PICO RIVERS, CALIFORNIA,
Los Angeles County Health Services Dept., Calif. Immunization Project.
For primary bibliographic entry see Field 5F.
W75-11005

SEASONAL VARIATION IN COMPOSITION, PLANT BIOMASS, AND NET PRIMARY PRODUCTIVITY OF A TROPICAL GRASSLAND AT KURUKSHETRA, INDIA,
Kurukshetra Univ. (India). Dept. of Botany.
For primary bibliographic entry see Field 2I.
W75-11006

ROOT:SHOOT AND LEAF AREA RELATIONSHIPS OF MACROPHYTE COMMUNITIES IN CHAUTAUQUA LAKE, NEW YORK,
State Univ. Coll., Fredonia, N.Y. Dept. of Biology.
S. A. Nicholson, and D. G. Best.
Bull Torrey Bot Club. Vol 101, No 2, p 96-100, 1974.

Descriptors: *New York, *Roots, *Leaves, Growth rates, Lakes, Water pollution effects.
Identifiers: *Chatauqua Lake(NY), *Macrophytes, Potamogeton-richardsonii, Shading, Vallisneria-americana.

Root:shoot, Leaf:shoot, and leaf surface area:weight ratios were consistent in Vallisneria americana and Potamogeton richardsonii from Chautauqua in all except the smallest individuals. Root:shoot ratio increased across the aquatic hydrosere, i.e., from submergent to floating leaf to emergent communities, but leaf area index (LAI) varied little. LAI in most undisturbed native communities ranged between 5-7 sq m/sq m but disturbed communities dominated by the alien Potamogeton crispus had LAI's of 11 sq m/sq m or more. Since these communities are very unstable and characterized by explosive growth, decreased life span, and spontaneous dieoff, and since P. crispus is an introduced species, the high LAI's may be maladjusted to local conditions. A community exhibiting high LAI's soon suffers excessive shading and spontaneous dieoffs.--Copyright 1974, Biological Abstracts, Inc.
W75-11009

SOME OBSERVATIONS ON BEHAVIOR OF THE TREATED SEWAGE DISPOSED IN THE SEA,
Nihon Univ., Tokyo (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5B.
W75-11020

EFFECT OF DDT AND M.S. 222 ON LEARNING A SIMPLE CONDITIONED RESPONSE IN RAINBOW TROUT (SALMO GAIRDNERI),
Alberta Univ., Edmonton. Dept. of Zoology.
P. G. McNicholl, and W. C. Mackay.
Journal of the Fisheries Research Board of Canada, Vol 32, No 5, p 661-665, May 1975. 1 fig, 2 tab, 33 ref.

Descriptors: *Salmonids, *Rainbow trout, *DDT, *Toxicity, *Mortality, *Fish physiology, *Fish behavior, Laboratory tests, Design, Water pollution effects.
Identifiers: MS222, LD50, Learning rate, Conditioning experiments, Bioaccumulation.

Rainbow trout (Salmo gairdneri) were force fed, with and without M.S. 222 anesthesia, pellets containing DDT equivalent to 0, 10 and 100% of the 96-h LD50 dose of 0.03 mg DDT/g body weight. DDT at the LD50 dose significantly increased learning rate 48 and 72 h after treatment. Although the 10% LD50 group did not learn significantly faster than controls, their slightly improved learning rate indicated a dose-dependent response curve. M.S. 222 did not affect learning rate of a simple conditioned response whether or not the anesthetic was combined with DDT. (Katz)
W75-11025

TOXAPHENE EFFECTS ON GROWTH AND BONE COMPOSITION OF FATHEAD MINNOWS, PIMEPHALES PROMELAS,
Fish and Wildlife Service, Columbia, Mo. Fish-Pesticide Research Lab.
P. M. Mehrle, and F. L. Mayer, Jr.
Journal of the Fisheries Research Board of Canada, Vol 32, No 5, p 593-598, May 1975. 1 fig, 3 tab, 23 ref.

Descriptors: Marine fish, *Minnows, *Fish physiology, *Bioassay, *Metabolism, *Growth rates, *Toxicity, *Halogenated pesticides, *Chlorinated hydrocarbon, Laboratory tests, Water pollution effects, Insecticides.
Identifiers: *Fathead minnows, Pimephales promelas, Tissue analysis, Bioaccumulation, *Toxaphene, *Organochlorine insecticides.

Fathead minnows *Pimephales promelas) were exposed to toxaphene (55-1230 ng/liter) in a flow-through diluter system for 150 days. Growth was not affected by toxaphene for up to 90 days of exposure, but within 150 days it was significantly reduced at all concentrations. Collagen content of the backbone was decreased ($P < 0.05$), amino acid composition was changed, and calcium concentration was increased. Results suggest that toxaphene altered the development and quality of the backbone, and induced biochemical manifestations of the 'broken-back' syndrome. (Katz)
W75-11026

FACTORS INFLUENCING ACUTE TOXICITY ESTIMATES OF HYDROGEN SULFIDE TO FRESHWATER INVERTEBRATES,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
D. M. Oseid, and L. L. Smith, Jr.
Water Research, Vol 8, No 10, p 739-746, October 1974. 2 fig, 14 tab, 11 ref.

Descriptors: *Invertebrates, *Amphipoda, *Isopods, *Toxicity, *Hydrogen sulfide, *Bioassay, *Mortality, Aquatic animals, Environmental effects, Water pollution effects, Laboratory tests.
Identifiers: Ephemeroptera, LC50, Survival rates, Sublethal level, Assellus militaris, Crangonyx richmondensis, Gammarus pseudolimnaeus, Baetis vagans, Ephemera simulans, Hexagonia limbata, Bioaccumulation.

Acute bioassay tests of hydrogen sulfide were run on freshwater invertebrates (Assellus militaris, Crangonyx richmondensis, Gammarus pseudolimnaeus, Baetis vagans, Ephemera simulans, and Hexagenis limbata. Size and type of test chamber, type of substrate for burrowing forms or those seeking shelter in gravel, oxygen concentration, pH, and season of collection influenced the sensitivity of organisms. Hydrogen sulfide exposure of sublethal levels reduced feeding activity of Gammarus. 96-h LC50 hydrogen sulfide concentrations ranged from 1.07 mg/l for Assellus to 0.020 mg/l for Baetis. (Katz)
W75-11027

RELATIONS BETWEEN ALGAL POPULATIONS AND THE PH OF THEIR MEDIA,
Bor Ilan Univ., Ramat-Gan (Israel). Dept. of Life Sciences.
Z. Dubinsky, and J. Rotem.
Oecologia, Vol 16, No 1, p 53-60, 1974. 5 fig, 27 ref.

Descriptors: *Algae, *Diatoms, *Hydrogen ion concentration, *Temperature, Laboratory tests, Environmental effects, Aquatic environment, Primary productivity, Water pollution effects, Pollutant identification.
Identifiers: Achnantes minutissima, Synedra radians, Synedra ulna, Synedra acus, Cymbella affinis, Gomphonema parvulum.

Natural, mixed algal populations (Achnantes minutissima, Synedra radians, S. ulna, Cymbella affinis, and Gomphonema parvulum) grew well in artificial media of different pH levels between 5 and 12. Algal growth caused marked changes in the pH of the culture media, raising the low pH values and lowering the high ones. Within 3-4 weeks all cultures reached the pH range of 8.5-11.0, while sterile controls retained a much wider range of 4.0-10.0. Final pH values and the rate of pH change were temperature dependent. (Katz)
W75-11028

MERCURY CONTENT OF WHALES, (IN JAPANESE),
For primary bibliographic entry see Field 5B.
W75-11029

THE INFLUENCE OF THE WARM COOLING WATER FROM A FOSSIL FUELED POWER PLANT ON OCEANOGRAPHIC CONDITIONS AND COMPOSITION OF PLANKTON IN OWASE BAY I. WATER TEMPERATURE IN RELATION TO DISTRIBUTION OF MICROPLANKTON, (IN JAPANESE),
Shimonoseki Univ. of Fisheries (Japan).
A. Tsuruta, and S. Tawara.
The Journal of the Shimonoseki University of Fisheries, Vol 23, No 3, p 121-136, 1975. 7 fig, 2 tab, 10 ref.

Descriptors: Effluents, Waste water(Pollution), *Thermal pollution, *Thermal powerplants, *Primary productivity, *Secondary productivity, *Plankton, Copepods, Sampling, Environmental effects, Seasonal, Cooling water, *Water temperature, Water pollution effects, *Cooling water, Bays.
Identifiers: Warm cooling water, *Chromonadae, Copepoda nauplii, Bacillariophyceae, Japan(Owase Bay).

The influence of warm cooling water from a fossil fueled power plant on oceanographic conditions and plankton in Owase Bay was investigated. The distribution of temperature of the water surface depended on the interaction of the warm cooling water, the Naka River, and the oceanic water. Plankton groups, chromonadae, showed seasonal variation. Copepoda nauplii and Bacillariophyceae were less abundant in the area affected by the discharged water from the power plant than in the other areas. (Katz)
W75-11030

COPPER TOXICITY IN BUSYCON CANALICULATUM L.,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
S. B. Betzer, and P. P. Yevich.
The Biology Bulletin, Vol 148, No 1, p 16-25, February 1975. 6 fig, 2 tab, 13 ref.

Descriptors: *Copper, *Metals, *Gastropods, *Snails, *Toxicity, *Traces, Animal physiology, Lethal limits, Path of pollutants, Bioassay, Laboratory tests, Water pollution effects.
Identifiers: 64Cu, *Busycon canalicalatum, Tissue analysis, Bioaccumulation, Histology.

The effects of high concentrations of copper in seawater upon channeled whelk, Busycon canaliculatum, were followed histologically, by determination of tissue Cu concentrations, and by tracing uptake with radioactively labelled copper (64Cu). Whelks showed a high resistance to ionic Cu, with a tolerance limit between 200-500 micrograms/liter at normal temperatures for the exposure period of 54-77 days. At lethal concentration, Cu was accumulated at the gill and osphradium. (Katz)
W75-11031

IMPACT OF THERMAL EFFLUENT FROM STEAM-ELECTRIC STATION ON A MARSHLAND NURSERY AREA DURING THE HOT SEASON,
Florida Univ. at Marineland, St. Augustine. C.V. Whitney Marine Lab.
W. E. S. Carr, and J. T. Giesel.
Fishery Bulletin, Vol 73, No 1, p 67-80, January 1975. 6 fig, 5 tab, 14 ref.

Descriptors: Effluents, Freshwater fish, *Bioassay, *Water pollution effects, *Thermal powerplants, *Seasonal, *Summer, *Marshes, Temperature, Laboratory tests, Environmental effects, *Thermal pollution.
Identifiers: *Steam-electric plants, Mullet, Silverside, Spot, Atlantic menhaden, Silver perch, Atlantic tread herring, Mugil curema, Mugil cephalus.

Fish were collected during the hot season from three similar marshland creeks situated at various distances from a steam-electric station and analyzed for species composition and for density and biomass per unit area. 48 species were identified. In the thermally affected creeks, both the numbers and biomass of juveniles were 3-10 fold smaller than those obtained from the creek at ambient temperature. (Katz)
W75-11032

STUDIES ON TOXICITY OF SODIUM NIFURSTYRENATE (NFS-NA) IN CULTURED YELLOWTAIL (IN JAPANESE),
Nagasaki Univ. (Japan).
T. S. Ishihara, S. Kashiwagi, and M. Yasuda.
Bulletin of the Faculty of Fisheries on Nagasaki University, No 37, p 17-22, August 1974. 5 fig, 4 tab, 10 ref. (English abstract).

Descriptors: *Fish, *Fish physiology, *Fish diseases, *Toxicity, *Organic compounds, Mortality, Aquaculture, Fish farming, Environmental effects, Water pollution effects.
Identifiers: *Yellowtail, *Sodium nifurstyrenate, NFS-Na, Bioaccumulation, Bacterial pseudotuberculosis, Pasteurella piscicida.

Bacterial pseudotuberculosis, caused by pasteurella piscicida was associated with serious mortality of cultured young yellowtail during the summer months in many yellowtail farms. Sodium nifurstyrenate (NFS-Na) was effective against the pathenogenic organism. Determination of long-term toxicity of NFS-Na was sought. (Katz)
W75-11034

UTILIZATION OF STREAM-BORNE PHOSPHORUS BY CAYUGA LAKE PHYTOPLANKTON,
New York State Coll. of Agriculture and Life Sciences, Ithaca, N.Y. Ecology and Systematics Section.
J. P. Barlow.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 714, $3.25 in paper copy, $2.25 in microfiche. Research Project Technical Completion Report. Cornell University Water Resources and Marine Sciences Center, August 1975. 7 p, 8 ref. OWRT A-053-NY(1). 14-31-0001-5032.

Descriptors: *Lakes, *Streams, *Phosphorus, *Phytoplankton, Ecosystems, Biota, Bioassay, Tributaries, Management, Runoff, Flow, Measurement, Sampling, Estimating, Surveys, Research, Photosynthesis, Temperature, Mixing, *New York, Eutrophication, Water pollution effects.
Identifiers: *Cayuga Lake(NY), Rainstorms, Transparency, *Salmon Creek(NY).

Studies indicate that in the tributaries to Cayuga Lake, most of the phosphorus discharged is in the particulate form, during periods of high runoff. The effect of stream-borne phosphorus on lake ecosystems on whether it can be utilized by lake biota. For efficient lake management, a better understanding of the availability of phosphorus and its rate of introduction into lakes by streams is needed. Discussed are studies made to determine how much of the phosphorus introduced into Cayuga Lake by streams is available to phytoplankton. Salmon Creek was chosen for the initial studies; it supplies about 10% of the phosphorus input to the lake and is close to shore facilities at Portland Point. All observations were made just after rainstorms. Observed were changes in abundance and rates of photosynthesis of lake communities supplied with phosphorus in various forms. 'Batch' cultures to estimate relative availability of phosphorus in stream water and continuous flow experiments to determine rates of utilization were used. Bioassay techniques are useful for determining potential utilization of allochthonous phosphorus by lake phytoplankton. The difference in composition of stream and lake water offers an excellent opportunity to make quantitative studies of the fate of stream phosphorus in the lake. (Bell-Cornell)
W75-11036

PRELIMINARY INVESTIGATIONS INTO COPPER CYCLING IN INDIAN LAKE, MASSACHUSETTS: A LAKE TREATED ANNUALLY WITH COPPER SULFATE,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W75-11039

ADAPTATION OF COPEPOD POPULATIONS TO THERMAL STRESS,
Maryland Univ., Catonsville. Div. of Biological Sciences.
B. P. Bradley.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 706, $3.75 in paper copy, $2.25 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No 34, (1975). 16 p, 6 tab, 9 ref. OWRT A-027-MD(1). 14-31-0001-5020.

Descriptors: *Copepods, *Thermal stress, *Adaptation, Temperature, *Salinity, *Thermal pollution, Water pollution effects.
Identifiers: *Eurytemora affinis, Acclimation, *Temperature tolerance.

The range of temperatures tolerated by the copepod Eurytemora affinis was found to increase with increasing salinity and with temperature acclimation. Developmental temperature also had a positive influence, as did sex, at least at higher acclimation temperatures. The effects of salinity and acclimation were independent. Female adults were equally or more tolerant than males and pre-adult stages were significantly ($P < .01$) more tolerant than adults. Thus, the range of successful reproduction, and so survival, probably depends on the tolerance range of adults. Considerable individual flexibility, at <1 ppt and without prior acclimation, was demostrated by animals tolerating an increase in temperature from 3C to 33C in less than 2 hours. There was evidence of long-term (genetic) flexibility, which would allow the species to adapt to novel thermal environments.
W75-11046

SURVIVAL AND GROWTH RATE OF CHANNEL CATFISH AS A FUNCTION OF DISSOLVED-OXYGEN CONCENTRATION,
Arkansas Univ., Little Rock. Dept. of Electronics and Instrumentation.
R. W. Raible.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 708, $3.75 in paper copy, $2.25 in microfiche. Arkansas Water Resources Research Center, Fayettesville, Publication No 33, June 1975. 35 p, 13 fig, 7 tab, 7 ref. OWRT A-019-ARK(1), 14-31-0001-3804.

Descriptors: *Dissolved oxygen, *Growth rates, *Channel catfish, Fish farming, *Mortality, Fish management, Water pollution effects.

Channel catfish were raised in water-recirculating systems for several periods of about six months duration each. Initial stock was fingerling size fish (10 to 20 grams). At dissolved-oxygen levels below 2.5 parts per million, mortality was high. Fish raised in tanks held at dissolved-oxygen levels between 3.0 and 6.8 parts per million showed increased gains of weight for each increment of added oxygen. Weight gains were as much as 50 percent higher at 6.8 parts per million compared with weights at 3.0 parts per million. Feed conversion was good in all cases. When feeding was limited to demand, feed conversion was about the same at all oxygen levels, indicating that reduced oxygen levels resulted in reduced appetites for those fish at lower oxygen levels. The dissolved-oxygen level should be held as close to saturation as circumstances allow for maximum gain rate.
W75-11051

BIOCHROME ANALYSIS AS A METHOD FOR ASSESSING PHYTOPLANKTON DYNAMICS, PHASE II,
Arkansas Univ., Fayetteville. Dept. of Botany and Bacteriology.
R. L. Meyer.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 710, $4.25 in paper copy, $2.25 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Publication No 32, June 1975. 58 p, 12 fig, 8 ref, 2 append. OWRT B-037-ARK(1), 14-31-0001-4060.

Descriptors: *Phytoplankton, Reservoirs, Lakes, *Arkansas, *Algae, *Chlorophyll, Effluents, Eutrophication, Ammonia, Nitrates, Phosphates, Missouri, *Temporal distribution, *Spatial distribution, Primary productivity, Land use, Water temperature, Dissolved oxygen, Silicates, Water pollution effects.
Identifiers: Beaver Lake(Ark), White River, *Biochrome analysis.

Selected chemical, physical and biological parameters were determined for a man-made lake, Beaver Lake, on the White River of Arkansas and Missouri. The research program determined the qualitative and quantitative aspects of the temporal and spatial distribution of the algal subcommunities. The epipelic, epilithic, epizooic and metaphytic subcommunities had little influence on the euplanktonic subcommunity. The relationship between the qualitative and quantitative analysis of the biochromes chlorophyll-a, -b, and -c and the phytoplankton species clustered into biochrome sets is discussed. The temporal and spatial distributional patterns of temperature, oxygen, ammonia-N, nitrate-N, orthophosphate-P and silicates are described in parallel with the biological parameters. These data are related to land use practices on the two major feeder streams. One source is influenced by agricultural runoff and the other by suburbanization plus a sewage outfall from a small city. The effect of the transition from riverine to lentic conditions are also considered. (See also W75-06073)
W75-11052

PATHOGENIC FREE-LIVING AMOEBAE IN ARKANSAS RECREATIONAL WATERS,
Arkansas Univ., Fayetteville. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W75-11053

INFLUENCE OF OIL ON NUCLEIC ACIDS OF ALGAE,
Institute of Biology of the Southern Seas, Odessa (USSR).
I. A. Davavin, O. G. Mironov, and I. M. Tsimbal.
Marine Pollution Bulletin, Vol 6, No 1, p 13-15, January 1975. 6 tab, 10 ref.

Descriptors: *Algae, *Chlorophyta, *Rhodophyta, Plant physiology, Biochemistry, *Oil pollution, Water pollution effects, Analytical techniques, Laboratory tests, Primary productivity, Oil wastes, Pollutant identification.
Identifiers: Ulva lactuca, Grateloupia dichotoma, Polysiphonia opaca, DNA, RNA, Polymerization, *Nucleic acids, Biosynthesis, Tissue analysis, Bioaccumulation.

Three species of algae, Ulva lactuca, Grateloupia dichotoma, and Polysiphonia opaca were exposed to 0.1, 1.0 and 10 ml/l concentrations of Romashkinskaya oil. DNA separation to determine the degree of polymerization was carried out for labile and stable DNA and total DNA. Quantitative determinations were made of nucleic acids. Oil appeared to inhibit biosynthesis of DNA and RNA and to modify the degree of polymerization of deoxyribonucleic acids. (Katz)
W75-11080

A REEVALUATION OF THE COMBINED EFFECTS OF TEMPERATURE AND SALINITY ON SURVIVAL AND GROWTH OF BIVALVE LARVAE USING RESPONSE SURFACE TECHNIQUES,
Oregon State Univ., Corvallis. School of Oceanography.
R. G. Lough.
Fishery Bulletin, Vol 73, No 1, p 86-94, January 1975. 9 fig, 3 tab, 9 ref.

Descriptors: *Growth stages, *Mollusks, Aquatic animals, *Temperature, *Salinity, *Larvae, Equations, *Clams, *Oysters, Water quality, Aquaculture, Environmental effects, Water pollution effects.
Identifiers: Bivalves, Tolerance studies, Mercenaria mercenaria, Mulinia lateralis, Survival rates, Sublethal limits.

The combined effects of temperature and salinity on larval survival and growth of Crassostrea virginica, Mercenaria mercenaria and Mulinia lateralis as reported in the literature were critically examined using response surface techniques. The late veliger larvae generally have a greater tolerance to both temperature and salinity than the developing embryos. Each species shows its own characteristic change in temperature-salinity tolerance as it develops and approaches the range normally tolerated by adults as it matures. Maximum growth of the veliger larvae required higher temperatures and somewhat higher salinities than maximum survival. Differences in temperature-salinity ranges estimated for maximum survival and growth were significantly different for all three species. In each case growth showed a significant temperature-salinity interaction. Response surface plots are given for early larvae survival and late veliger survival and growth. Inferences of tolerance studies are made to the fields of pollution and aquaculture. (Katz)
W75-11081

STANDARD CURVES FOR NUVACRON, MALATHION, SEVIN, DDT, AND KELTHANE TESTED AGAINST THE MOSQUITO CULEX PIPIENS L. AND THE MICROCRUSTACEAN DAPHNIA MAGNA STRAUS,
Alexandria Univ. (Egypt). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W75-11082

THE ACCUMULATION OF CADMIUM, COPPER, MANGANESE AND ZINC BY FUCUS VESICULOSUS IN THE BRISTOL CHANNEL,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5B.
W75-11083

A COMPARISON OF EFFECTS OF ELEVATED TEMPERATURE VERSUS TEMPERATURE FLUCTUATIONS ON REEF CORALS AT KAHE POINT, OAHU,
Hawaiian Electric Co., Inc., Honolulu. Environmental Dept.
S. L. Coles.
Pacific Science, Vol 29, No 1, p 15-18, January 1975. 2 fig, 2 ref.

Descriptors: *Electric generators, *Temperature, *Thermal pollution, *Coral, Marine animals, Discharge(Water), Water pollution effects, Environmental effects, Mortality, Lethal limit, Monitoring.
Identifiers: *Pocillopora meandrina, Sublethal effects.

Bottom temperature and the condition of live corals in the vicinity of the discharge plume from an electric generating station were monitored. Mortality to Pocillopora meandrina was no greater under conditions of maximum thermal enrichment near the living reef fringe in the discharge area (1-2 m depth) than in an area (4-5m depth) more distant from the discharge. Although bottom temperatures in the discharge area continually varied 3-4 degrees within minute periods during every low tide, live corals seldom encountered temperatures exceeding 31 degrees C. The limited damage indicated that upper absolute temperatures are more critical in producing coral damage than are short-term temperature shocks near upper lethal limits. (Katz)
W75-11084

ABSORPTION AND ELIMINATION OF PHOTODIELDRIN BY DAPHNIA AND GOLDFISH,
Illinois Univ., Chicago. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W75-11085

UPTAKE OF CADMIUM, ZINC, COPPER, LEAD AND CHROMIUM IN THE PACIFIC OYSTER, CRASSOSTREA GIGAS, GROWN IN THE TAMAR RIVER, TASMANIA,
Tasmanian Dept. of the Environment, Hobart (Australia).
For primary bibliographic entry see Field 5B.
W75-11086

STUDIES ON THE INORGANIC COMPONENTS OF MARINE ANIMALS-III, ON THE CONTENTS OF CADMIUM, ZINC, COPPER, LEAD AND IRON IN MUSCLE AND VISCERA OF MARINE ANIMALS CAPTURED IN THE WEST SEA AREA OF KYUSHU, (IN JAPANESE),
Nagasaki Univ. (Japan).
Y. Nozaki, and S. Miyahara.
Bulletin of the Faculty of Fisheries of Nagasaki University, No 38, p 117-120, December 1974. 2 tab, 20 ref.

Descriptors: Aquatic animals, *Metals, Heavy metals, *Copper, *Cadmium, *Zinc, *Lead, *Iron, Animal physiology, Laboratory tests, Path of pollutants, Water pollution effects.
Identifiers: *Bioaccumulation, *Tissue analysis, Muscle, Viscera, *Japan(West Sea Area-Kyushu).

Cadmium, zinc, copper, lead and iron content of muscle and viscera of marine animals from the West Sea area of Kyushu were investigated. Results were as follows: the contents of Cd, Zn,

Cu, Pb, and Fe in muscle of 31 species were 0.01-0.18 ppm, 2.23-15.89 ppm, 0.48-7.25 ppm, 0.10-0.96 ppm and 5.08-50.62 ppm, respectively. The contents of Cd, Zn, Cu, Pb and Fe in viscera of 10 species were 0.18-0.39 ppm, 8.12-22.80 ppm, 0.79-4.69 ppm, 0.11-1.12 ppm and 23.68-152.37 ppm respectively. (Katz)
W75-11087

EFFECTS OF SOME COMPONENTS OF CRUDE OIL ON YOUNG COHO SALMON,
Alaska Univ., College. Dept. of Biological Sciences.
J. E. Morrow, R. L. Gritz, and M. P. Kirton.
Copeia, No 2, p 326-331, 1975. 1 fig, 2 tab, 8 ref.

Descriptors: *Salmonids, *Salmon, *Juvenile growth stage, *Organic compounds, *Toxicity, *Oil wastes, Fish physiology, Fish behavior, Environmental effects, Laboratory tests, Water pollution effects, Pollutant identification.
Identifiers: *Coho salmon, Oncorhynchus kisutch, Bioaccumulation, Tissue analysis, Blood analysis.

Among oil components tested for toxicity to young coho salmon, Oncorhynchus kisutch, aliphatic compounds produced no significant mortalities. Mono-cyclic aromatics were generally toxic; the degree of toxicity increasing with the degree of unsaturation. It was suggested that the toxicity of these substances resulted through alteration of cell membrane permeability, especially in the gills. This resulted in a rapid increase in the concentration of monovalent ions in blood and probably interfered with CO2-HCO3 regulation. The behavior of fish treated with the various pure substances was an accelerated and exaggerated version of the behavior under crude oil. (Katz)
W75-11088

THE EFFECTS OF CRUDE OILS AND THE DISPERSANT COREXIT 8666 ON SEA URCHIN GAMETES AND EMBRYOS,
Tromso Univ. (Norway). Inst. of Biology and Geology.
S. Lonning, and B. E. Hagstrom.
Norwegian Journal of Zoology, Vol 23, No 2, p 121-130, April 1975. 9 fig, 2 tab, 14 ref.

Descriptors: Marine animals, *Growth stages, *Embryonic growth stage, *Toxicity, Animal physiology, Microscopy, Oil wastes, Environmental effects, Laboratory tests, Water pollution effects.
Identifiers: *Sea urchins, Psammechinus miliaris, Psammechinus lividus, *Corexit 8666, *Gametes, Embryogenesis, Fertilization, *Oil dispersants, Bioaccumulation.

The gametes and embryos of sea urchins, Psammechinus miliaris and P. lividus, were used to determine the effects inflicted by Kuwait and Ekofisk crude oil and/or the oil dispersant Corexit 8666. In most experiments the substances were present throughout the development, but also short-term treatments were carried out. The test substances had a moderate effect on fertilization and early development, whereas harmful influences were observed during the further differentiation of the embryo. The ultramicrographs did not indicate any morphological changes in the cytoplasm after oil treatment. Corexit 8666 brought about an increase and an aggregation of oil droplets within the cells. (Katz)
W75-11090

THE EFFECTS OF OIL DISPERSANTS ON THE CELL IN FERTILIZATION AND DEVELOPMENT,
Tromso Univ. (Norway). Inst. of Biology and Geology.
S. Lonning, and B. E. Hagstrom.
Norwegian Journal of Zoology, Vol 32, No 2, p 131-134, April 1975. 2 tab, 10 ref.

Descriptors: *Marine fish, *Marine Animals, *Animal physiology, *Fish physiology, *Embryonic growth stage, *Fish eggs, Oil wastes, Environmental effects, Water pollution effects, Laboratory tests, Microscopy, Mortality.
Identifiers: *Sea urchins, *Oil dispersants, Strongylocentrotus draebachiensis, Strongylocentrotus pallidus, Gradus morrhua, Pleuronectes platessa, *Fertilization, *Gametes, Embryogenesis, Bioaccumulation.

The effects of oil dispersants were tested on larvae from sea urchins (Strongylocentrotus droebachiensis and S. pallidus) and marine fishes (Gadus morrhua and Pleuronectes platessa). The substances used were: BP1100, BP1100X, Corexit 8666, Corexit 7664, Dasic slickgone LT 2, Emulsol/Isopar M, Emulsol with Shellsol, Finasol OSR-2, and Superb Universal Cleaner. All substances affected the fertilization of the sea urchins negatively, and during development inhibition of skeleton and endoderm was often registered. Both in larvae from sea urchins and fishes some substances caused pathological larvae and rapid cytolysis. (Katz)
W75-11091

ENDEMIC NEPHROPHATHY AND ITS RELATION TO THE CONTAMINATION OF WELL WATER BY PHENOLIC COMPOUNDS IN BARSA-ARAD (NEFROPATIA ENDEMICA SI RELATIA CU IMPURIFICAREA PRIN COMPOUSI FENOLICI IN APELE FINTINILOR DIN COMUNA BARSA-ARAD),
For primary bibliographic entry see Field 5B.
W75-11105

SOUTH AFRICAN EUTROPHICATION PROBLEMS: A PERSPECTIVE,
National Inst. for Water Research, Pretoria (South Africa).
D. F. Toerien.
Water Pollution Contol, Vol 74, No 2, p 134-142, 1975. 2 fig, 7 tab.

Descriptors: *Eutrophication, Water pollution sources, Nutrient removal, Municipal wastes, Phosphorus, Aquatic algae, Oligotrophy, Nutrients, Industrial wastes, Africa, Impoundments.
Identifiers: *South Africa.

The problem of eutrophication in South Africa is discussed in terms of the nature and prevention of the problem, the restoration of eutrophic impoundments, present and future levels of eutrophication in South African waters, and a comparison of two South African impoundments. The following conclusions were made: eutrophication is a danger to the water quality of South African impoundments; the extent of this danger must be determined; most impoundments in South Africa are still oligotrophic; the eutrophic impoundments are those which receive effluents from urban-industrial complexes; phosphorus is presently the most important algal growth-limiting nutrient; oligotrophic conditions were found to exist below 30 microg-P/liter and eutrophic conditions above 75 microg-P/liter; the range of eutrophication problems already experienced include problems in water treatment, aesthetics, recreation, water weeds, livestock losses, tastes, and odors; the population and per capita were consumption increases expected will lead to more effluents reaching impoundments and to more eutrophication problems unless corrective measures are taken; eutrophication problems have a complex nature and their control is intimately associated with nutrient addition and economics; prevention of eutrophication problems can only be effected through the prevention of enrichment; successful prevention requires detailed knowledge of the specific impoundments under consideration; and, decisions to restore eutrophic lakes depend on many factors such as the uses of the water and the financial implication of restoration techniques. (Orr-FIRL)
W75-11131

TENSIDS (SYNDETS) AND THE WATER POLLUTION PROBLEM, (GESUND-HEITLICHE ASPEKTE DES TENSID-GEBRAUCHS),
Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Bodenund Lafthygiene.
For primary bibliographic entry see Field 5D.
W75-11134

BIOMAGNIFICATION OF DIELDRIN RESIDUES BY FOOD CHAIN TRANSFER FROM CLAMS TO BLUE CRABS UNDER CONTROLLED CONDITIONS,
Texas A and M Univ., College Station. Dept. of Biochemistry and Biophysics.
S. R. Petrocelli, J. W. Anderson, and A. R. Hanks.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 1, p 108-116, January 1975. 1 fig, 3 tab, 27 ref.

Descriptors: *Mollusks, *Clams, Crustaceans, *Crabs, *Dieldrin, *Chlorinated hydrocarbon, Pesticides, *Food chains, *Bioassay, Design, Estuaries, Laboratory tests, Environmental effects, Pesticide residues, Water pollution effects.
Identifiers: Rangia, Callinectes, *Blue crab, Biomagnification, Bioaccumulation, Tissue analysis.

The possibility of biological magnification of dieldrin residues in a two-part food chain consisting of clams, Rangia, and blue crabs, Callinectes, was tested. Clams with dieldrin concentrations of 193 and 181 micro-g/kg were fed to the crabs. Crabs incorporated 47%-78% of the dieldrin and concentrated dieldrin residues to 4.7 and 6.8 times the daily dose after 10 days of feeding. Implications of the magnification of organochlorine insecticide residues were discussed. (Katz)
W75-11135

SOME EFFECTS OF COPPER ON THE POLYCHAETE PHYLLODOCE MACULATA,
Stirling Univ. (Scotland). Dept. of Biology.
D. S. McLusky, and C. N. K. Phillips.
Estuarine and Coastal Marine Science, Vol 3, No 1, p 103-108, February 1975. 1 fig, 1 tab, 7 ref.

Descriptors: *Worms, Aquatic animals, *Metals, *Copper, *Bioassay, *Toxicity, *Lethal limit, Physiology, Laboratory tests, Water Pollution effects.
Identifiers: *Polychaetes, *Phyllodoce maculata, Bioaccumulation, Tissue analysis, LC-50, LT-50, Sublethal concentrations.

The lethal concentration of copper (0.08-1.00 part/million) and the accumulation of copper at various uptake concentrations for the polychaete Phyllodoce maculata were determined. The rate of uptake may be the lethal factor, rather than the amount of copper accumulated. (Katz)
W75-11136

THE EFFECTS OF EXPERIMENTAL BLACKFLY (DIPTERA: SIMULIIDAE) LARVICIDING WITH ABATE, DURSBAN, AND METHOXYCHLOR ON STREAM INVERTEBRATES,
Waterloo Univ. (Ontario). Dept. of Biology.
R. R. Wallace, A. S. West, A. E. R. Downe, and H. B. N. Hynes.
Can Entomol, Vol 105, No 6, p 817-831, 1973. Illus.

Descriptors: *Diptera, Invertebrates, Water pollution effects, *Larvicides, Aquatic insects, Ecology, *Insecticides, Aquatic drift, Sampling.
Identifiers: *Abate, *Blackfly, *Dursban, *Methoxychlor, Simuliidae.

The effects of Abate, Dursban, and Methoxychlor and their diluents on blackfly larvae and on 'non-

target' stream invertebrates were evaluated by means of cone, rock, Surber, and drift samples. Blackfly larvae were found in many post-treatment Surber samples, although concurrent cone and rock samples often indicated that blackfly larvae were either greatly reduced in numbers or eradicated from the streams. The insecticide diluents (heavy aromatic naphtha and fuel oil) caused detachment of blackfly larvae from cones, but less than that obtained when insecticide was added. The heavy post-treatment drift of 'non-target' invertebrates in treated streams was indicative of a considerable disturbance to the aquatic invertebrate community. However, post-treatment samples indicated that the 'non-target' organisms studied were not eradicated from the streams. There were several indications that the catch of invertebrate drift was altered by pools, which possibly exerted a delaying action on drifters in the treated streams. Most of the drifting invertebrates found in post-treatment drift nets were dead.--Copyright 1974, Biological Abstracts, Inc.
W75-11157

WATER POLLUTION FROM NONPOINT SOURCES,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5B.
W75-11158

DISSOLVED GAS SUPERSATURATION AND DILUTION IN THERMAL PLUMES FROM STEAM ELECTRIC GENERATING STATIONS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5B.
W75-11159

CONCENTRATION AND GENERA OF ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1973,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W75-11165

MUTAGENS AND POTENTIAL MUTAGENS IN THE BIOSPHERE: I. DDT AND ITS METABOLITES, POLYCHLORINATED BIPHENYLS, CHLORODIOXINS, POLYCYCLIC AROMATIC HYDROCARBONS, HALOETHERS,
National Center for Toxicological Research, Jefferson, Ark.
For primary bibliographic entry see Field 5B.
W75-11170

MUTAGENS AND POTENTIAL MUTAGENS IN THE BIOSPHERE: II. METALS--MERCURY, LEAD, CADMIUM AND TIN,
National Center for Toxicological Research, Jefferson, Ark.
For primary bibliographic entry see Field 5B.
W75-11171

AMMONIA EXCRETION BY ZOOPLANKTON AND ITS SIGNIFICANCE TO PRIMARY PRODUCTIVITY DURING SUMMER,
Washington Univ., Seattle. Dept. of Oceanography.
M. Jawed.
Available from the National Technical Information Service, Springfield, Va 22161 as RLO-2225-T26-12, $4.00 in paper copy, $2.25 in microfiche. Report RLO-2225-T26-12, (1973). 26 p, 2 fig, 2 tab, 23 ref. NR 083 012. AEC AT(45-1)2225, NO0014-67-A-0103-0014.

Descriptors: *Marine microorganisms, *Zooplankton, *Pacific Ocean, *Ammonia, *Nitrogen, Primary productivity, Shallow water, Plankton, Jelly fish, Columbia River, Nitrates, Oceans, *Washington, *Oregon, Coasts, Upwelling, Entrainment.
Identifiers: *Ammonia excretion, Nutrient sources.

To understand biological processes in relation to environmental factors, ammonia excretion by zooplankton was studied off the coasts of Washington and Oregon. Ammonia excretion rates off these coasts varied from 0.16-0.60 micrograms of ammonia nitrogen per mg dry weight/day for planktonic animals and 0.02 to 0.06 for jellyfish. The effect of size of the various species was not observed. Seawater ammonia concentration was low in offshore regions. In the Columbia River plume offshore, excreted ammonia accounted for about 90% of the total nitrogen requirements for observed primary productivity in the summer. Ammonia excreted by zooplankton in the upper oceanic waters contributed about 36% of the total nitrogen requirements of primary production. In inshore waters, nitrogenous excretion by zooplankton was relatively unimportant. Replenishment of nitrogenous sources in surface layers of inshore waters was greatly enhanced by river-induced entrainment and wind-induced upwelling of deeper water. (Buchanan-Davidson--Wisconsin)
W75-11187

DISSOLVED ORGANIC MATTER AND LAKE METABOLISM,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
R. G. Wetzel.
Available from the National Technical Information Service, Springfield, Va 22161 as COO 1599-79, $4.00 in paper copy, $2.25 in microfiche. Technical Progress Report COO-1599-79, April 1973-March 1974. 31 p, 1 fig, 2 tab, 29 ref. AEC AT(11-1)1599.

Descriptors: *Dissolved solids, *Organic matter, *Lakes, *Metabolism, *Michigan, *Eutrophication, Cycling nutrients, Organic compounds, Nutrient requirements, Chemical analysis, Phytoplankton, Sessile algae, Nitrogen cycle, Carbon cycle, Inorganic compounds, Bacteria, Chelation, Growth rates, Sediments, Littoral, Photosynthesis, Productivity, Decomposing organic matter, Inflow, Deep water, Detritus, Trophic level.
Identifiers: *Lawrence Lake(Mich).

This annual report describes investigations on qualitative and quantitative cycling of particulate and dissolved organic matter in lakes. Interactions of dissolved organic matter with inorganic nutrient cycling and regulation of the metabolism of micro- and macroflora were studied. Sources, fates, pathways, and interactions of dissolved organic matter in inorganic chemical cycling, allochthonous sources, metabolism, and inputs to lake systems of increasing stages of eutrophication as related to nutrient physiology and metabolism of phytoplankton, sessile algae, macrophytes, and bacteria were studied. Regulatory mechanisms of growth and rates of carbon recycling were evaluated by studying quantitative control mechanisms among microflora of pelagial zones of lakes of progressively greater eutrophy, littoral photosynthetic producer-decomposer complex, and allochthonous inorganic-organic influxes and their biotic processing. Quantification of the dynamic carbon fluxes among these components and their rate control mechanisms was fundamental to the elucidation of the rate functions of lake eutrophication. A functional detrital carbon budget was evaluated for an oligotrophic lake (Lawrence Lake, Michigan) and is being extended to more productive lakes. The fate and mechanisms regulating the qualitative and quantitative utilization and losses of organic carbon are being studied. (Buchanan-Davidson--Wisconsin)
W75-11188

INVESTIGATION OF THE INFLUENCE OF THERMAL DISCHARGE FROM A LARGE ELECTRIC POWER STATION ON THE TEMPERATURE AND NEAR-SHORE CIRCULATION OF LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
C. H. Mortimer, and G. K. Sato.
Available from the National Technical Information Service, Springfield, Va 22161 as COO-2158-9, $4.00 in paper copy, $2.25 in microfiche. Progress Report COO-2158-9, July 1973-September 1973. 4 p, 1 fig, AEC AT(11-1)2158.

Descriptors: *Lake Michigan, *On-site data collections, Technology, *Thermal pollution, Water circulation, Electric powerplants, *Wisconsin, Heated water, Water temperature, Wind velocity, Anemometers, Currents(Water), Current meters, Histograms.
Identifiers: *Oak Creek Power Plant(Wis).

This quarterly progress report on nearshore circulation of Lake Michigan near the Oak Creek Power Plant, Oak Creek, Wisconsin presents information on data obtained from current meters and wind data obtained from anemometers at the Milwaukee Airport and at the power plant. The data is being processed, analyzed, and compared with previous data. Progressive vector diagrams will be made to provide information on the characteristics of nearshore circulation. Instead of developing histograms of current direction and speed, a computer program will be developed to compute vector frequency plots. These plots will combine speed and direction frequencies into one diagram and indicate dominant speeds and directions. Difficulties concerning the premature release of current meters and their defective recording are being investigated. (Buchanan-Davidson--Wisconsin)
W75-11190

THE ROLE OF PLANKTONIC PROTOZOA IN THE MARINE FOOD CHAIN. SEASONAL CHANGES, RELATIVE ABUNDANCE, AND CELL SIZE DISTRIBUTION OF TINTINNIDA,
New York Aquarium, Brooklyn. Osborn Labs. of Marine Sciences.
K. Gold.
Available from the National Technical Information Service, Springfield, Va 22161 as COO-3390-7, $4.00 in paper copy, $2.25 in microfiche. Progress Report COO-3390-7, May 1972-April 1973. 21 p, 17 fig. AEC AT(11-1)3390.

Descriptors: *Biological communities, *Marine microorganisms, *Protozoa, *Systematics, Dimensions, Sea water, Neritic, Cultures, Invertebrates, Surf, Measurement, Coasts, Diets, Growth rates, Seasonal, Water temperature, *New York.
Identifiers: *Tintinnida, Codonella acuta, Stenosemella oliva, Tintinnopsis beroidea, Tintinnopsis tubulosa, Coney Island(NY), Eurythermal organisms.

Tintinnida species identified in the winter-spring plankton community collected beyond the surf zone near Brooklyn, New York, were Codonella acuta, Stenosemella oliva, Tintinnopsis beroidea, and T. tubulosa, in order of relative abundance. Plots of species lorica length and width showed variability in species size. In February the Codonella population increased and in April its dimensions were more variable. The width dimension was a better guide to speciation than length or length:width ratio. Length was an excellent guide to cell growth and division. During winter T. tubulosa was actively growing with both juvenile and older forms but in April no juvenile forms were present. Time of exposure to elevated temperature had little effect on size distribution of T. tubulosa. Casting off empty loricas was independent of temperature and cell age. When T. beroidea and T. tubulosa were grown in culture, growth was proportional to amount of phytoflagellate food and not affected by diatom flora present; neither probiotic or predatory effects were observed between the species. Food requirements increased at 15C.

At 20C cell yield declined; T. tubulosa could not withstand the grazing pressure of Strobilidium. (Buchanan-Davidson--Wisconsin)
W75-11191

UNISEX STUDIES ON THE WHITE AMUR,
Bureau of Sport Fisheries and Wildlife, Stuttgart, Ark. Fish Farming Experiment Station.
J. G. Stanley.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 89-95, August 1974. 5 fig.

Descriptors: *Aquatic weed control, *Fish sterilants, Fish, *Fish reproduction, Fish stocking, Fish diets, Cycling nutrients, Energy budget, Bass, Nitrogen, Phosphorus, Oxygen requirements, Biomass, Number fish per acre, Carp, *Georgia, *Arkansas.
Identifiers: *White amur, *Unisex fish, *Gynogenesis, Elodea, Goldfish, Hybrid fish.

The performance of white amur without danger of reproduction and permanent establishment, artificial gynogenesis, requiring contact of spermatozoa with ovum without fusion, was studied using white bass or x-irradiated milt on eggs, followed by cold shock, but yields were small. Hybridization between goldfish-amur and common carp-amur produced successful crosses, with carp-amur showing better survival; aquatic vegetation was their primary food. Amur excreted more nitrogen than was present in the elodea they consumed, but most of the phosphorus was excreted. Amur digested vegetation inefficiently but converted assimilated food into fish biomass well, due to low metabolic rates. They stopped feeding at approximately 2.5 ppm oxygen. In Georgia stocking approximately 100 pounds amur/acre was ineffective in controlling elodea, thus higher stocking rates would be required where winter plant die-offs do not occur. At the Fish Farming Development Center, Kelso, Arkansas 55 or more fingerlings/acre amur controlled Pithophora, Najas, and duckweed. The native fish yield was ten times higher in ponds with 55-96 amur fingerlings/acre; more amur decreased fish yields and depleted vegetation. Amur did not eat the same food as channel catfish, largemouth bass, bluegill, or green sunfish, but competed with buffalo and carp. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11205

HERBICIDE CHEMICALS AND THEIR EFFECT ON THE AQUATIC ENVIRONMENT,
Bureau of Sport Fisheries and Wildlife, Washington, D.C. Div. of Fishery Research.
C. R. Walker.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p C3-C18, August 1974. 72 ref.

Descriptors: *Toxicity, *Herbicides, *Aquatic weed control, *Aquatic environment, 2-4-D, Pesticide residues, Pesticide toxicity, Pesticide removal, Pesticides, Persistence, Insecticides, Polychlorinated biphenyls, Chlorinated hydrocarbon pesticides, Catfishes, Carbamate pesticides, 2-4-5-T, Minnows, Sunfishes, Fish, Channel catfish, Bass, Fish control agents, Antimycin A, Aquatic insects, Food chains, Water pollution effects.

A critical relationship exists between the chemical character of water and the flora and fauna it supports. Biocide effects on aquatic environment must be studied and safety and environmental quality considered in pesticide selection. No registered aquatic herbicide meets criteria for all uses or has been labeled with residue to tolerance limits in water, fish, or shellfish. The fate of herbicide residues and effects on fish, fish-food organisms, and other aquatic organisms must be ascertained. Residue toxicities of different 2,4-D esters on various fish differ. The butoxyethanol ester of 2,4-dichlorophenoxyacetic acid (2,4-D BEE) was only present in fish livers; other organs contained 2,4-D acid. Excretion occurred via the kidneys and gills. High tissue 2,4-D BEE residues tranquilized fish. Hydrolysis of 2,4-D BEE in water was rapidly accelerated by the presence of fish. Basic research on the effects of weed control methods on plant nutrients and energy in aquatic ecosystems and selective use of biocides to maximize fish yields is needed. Effects of fish toxicants, insecticides, and herbicides have been studied. Pesticides must be adequately labeled, screened, and evaluated. Cost-benefit aspects of pesticide use must include analysis of energy flow limiting factors and biomass produced at each trophic level with respect to the species managed. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11211

PRIMARY PRODUCTION IN LAKES ONTARIO AND ERIE: A COMPARATIVE STUDY,
Canada Centre for Inland Waters, Burlington (Ontario).
W. A. Glooschenko, J. E. Moore, M. Munawar, and R. A. Vollenweider.
Journal of the Fisheries Research Board of Canada, Vol 31, No 3, p 253-263, 1974. 10 fig, 2 tab, 19 ref.

Descriptors: *Lake Ontario, *Lake Erie, *Great Lakes, *Primary productivity, Photosynthesis, Measurement, Ecological distribution, Spatial distribution, Temporal distribution, Carbon, Trophic level, Eutrophication, Seasonal, Annual succession, Fluctuations, Chlorophyll.

A study of temporal and spatial variations in primary production in Lakes Erie and Ontario is described. Surface and integral measurements using C14 were used to compare productivity in terms of trophic status. Lake Ontario primary production was low in winter, reached a maximum in midspring, declined in summer, and increased in fall. Inshore water production rate increased more in spring and early summer, with a greater maximum reached earlier than in offshore waters. Assimilation numbers (mg C fixed/mg chlorophyll-a per hour) had a yearly range of 1.2-1.6. Primary production in both lakes showed a linear relationship to chlorophyll-a. Lake Erie primary production varied; the Eastern Basin production was highest in spring, declined in midsummer, and increased slightly in fall; the Western Basin had a midsummer maximum; and the Central Basin had peaks in late summer and early fall. Assimilation numbers showed a westerly increase. Surface production was equal in both lakes until early summer and in November-December, but integral photosynthesis was higher in Lake Ontario. Lake Erie summer production was higher. From April-December the total estimated yield for Lake Ontario was 170 g C/sq m and for the Lake Erie basins, 160, 210, and 310 g C/sq m. (Buchanan-Davidson--Wisconsin)
W75-11217

MICROBIOLOGICAL EXAMINATION OF OFFSHORE LAKE ERIE SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
B. J. Dutka, J. B. Bell, and D. L. S. Liu.
Journal of the Fisheries Research Board of Canada, Vol 31, No 3, p 299-308, 1974. 5 fig, 2 tab, 30 ref.

Descriptors: *Microorganisms, *Lake Erie, *Lake sediments, Cores, Bacteria, Oxygen demand, Great Lakes, Distribution patterns, Oxidation-reduction potential, Microbiology.

Bacterial distribution and density were studied in sediment cores of the Central and Western Basins of Lake Erie. Eh values indicated cores were devoid of oxygen and oxygen uptake rates differed between the Central and Western Basin sediments. The biological oxygen demand in surface sediments was 75% and in the lower sediments, 11-45%. Heterotrophic bacteria concentrations were proportional to available organic matter and reflected the number of heterotrophs surviving by facultative mechanisms in a deoxygenated environment. Sulfate reducing bacteria were constant through the core. Large organic sulfur reducing populations indicated an organic matter supply. Sulfur oxidizing bacteria were high in the top three cm. Densities of nitrogen cycle bacteria at sediment-water interfaces were similar at both basins but ammonifying and denitrifying bacteria in lower core layers varied. Nitrifying bacteria were found throughout the cores. Phosphate solubilizing bacteria were high in the top 5-6 cm and decreased below 10 cm. Iron and manganese oxidizing bacteria were low in deeper sediments. Overlying waters contained fewer bacteria than those in surface sediments. Offshore sediments not directly influenced by land inputs contained similar homogeneously distributed bacterial populations which varied little between surface sediment and the 5 cm level. (Buchanan-Davidson--Wisconsin)
W75-11218

ALGAE IN BALTIMORE'S RESERVOIRS,
Baltimore City Dept. of Public Works, Md. Water Supply Treatment and Pumping Div.
J. A. Valcik.
Journal of the American Water Works Association, Vol 67, No 3, p 109-113, 1975. 2 fig, 12 ref.

Descriptors: *Water treatment, *Algae, *Reservoirs, *Nuisance algae, *Maryland, Agricultural runoff, Chlorides, Nitrates, Runoff, Hydrogen ion concentration, Water pollution sources, Industrial wastes, Odor, Water costs, Municipal wastes, Potable water, Chlorella, Color, Land use, State jurisdiction, Legislation, Diatoms, Chlorophyta, Cyanophyta, Eutrophication.
Identifiers: *Baltimore(Md), Loch Raven Reservoir(Md), Prettyboy Reservoir(Md).

Reservoirs supplying water for Baltimore, Maryland experience problems related to seasonal occurrences of nuisance algae. Surveys in 1970-1971 showed that most of the pollution then was the result of poor agricultural practices; industrial and domestic waste water effluents were secondary nutrient sources. Water in the Montebello Filter Plant gradually deteriorated, and in 1974 a serious algal problem was observed in raw water entering the plant. Chlorella predominated, followed by Oocystis, and a greenish-yellow color was present in sedimentation basin effluents. A green algal bloom occurred in the Loch Raven Reservoir. Seasonal application of an algicide, reservoir aeration, use of a coagulant, and activated carbon were considered as treatment measures. Algal blooms were observed in the Liberty Reservoir in the 1960's, and diatoms caused reductions in the filter-run times of the Ashburton Filter Plant in 1967-1968. Similar problems are expected to increase in the future. Correctional treatment is costly. State and local agencies must cooperate to limit discharges of nutrient wastes into watersheds by legislative control of land usage and land management practices to limit discharges of nutrient wastes into the watersheds. (Buchanan-Davidson--Wisconsin)
W75-11221

APPLICATION OF THE MANOMETRIC TECHNIQUE IN THE STUDY OF SEDIMENT OXYGEN DEPLETION,
Canada Centre for Inland Waters, Burlington (Ontario).
D. Liu.
Canadian Research and Development, Vol 6, No 2, p 35-37, 1973. 6 fig, 1 tab, 10 ref.

Descriptors: *Analytical techniques, *Manometers, *Bottom sediments, *Oxygen sag, *Oxygen demand, Hypolimnion, Measurement, Anaerobic conditions, Biochemical oxygen demand, Chemical oxygen demand, Carbohydrates, *Lake sediments, Lake Erie, Lake Ontario.

The results of the manometric technique used in oxygen budget research are described. In addition to showing the rate and extent of oxygen consumption, the effects of other environmental conditions, such as temperature, pH, etc., may also be ascertained. This technique was used to study Lakes Erie and Ontario sediments with regard to the profile of oxygen consumption in the sediment column, the differential of the biological oxygen consumption from the chemical oxidative process by the use of a metabolic inhibitor, and the correlation between carbohydrate content and the community respiration rate. A Gilson differential respirometer was used to study the profile of oxygen consumption in lake sediment to a depth of 20 cm below the water-mud interface. The high sensitivity of the manometric method (it will detect changes of 20 microgram oxygen) has an overwhelming advantage over the conventional titration method. But application to a real lake system depends on the solution of the problem of how to reproduce the lake mixing processes in the laboratory. Shaking or disturbance greatly increases the lake sediments' oxygen consumption rate, therefore caution must be exercised when considering plans to use mechanical dredging for the removal of polluted sediment from Lake Erie. (Auen-Wisconsin)
W75-11222

THE EFFECTS OF THE FORMATION OF LAKE KAINJI (NIGERIA) UPON THE INDIGENOUS FISH POPULATION,
Ife Univ. (Nigeria). Kainji Dam Research Project.
D. S. C. Lewis.
Hydrobiologia, Vol 45, No 2/3, p 281-301, 1974. 3 fig, 18 ref.

Descriptors: *Fish populations, *Africa, *Post-impoundment, *Environmental effects, Reservoirs, Fish food organisms, Rivers, Succession, Prey fish, Herbivores, Bottom fish, Fish establishment, Fish types, Detritus, Omnivores, Carnivores.
Identifiers: *Nigeria, *Lake Kainji(Nigeria), River Niger(Nigeria), Isectivores.

Closure of Kainji Dam resulted in conversion of 137 kilometers of the River Niger into Kainji Lake, thus transforming a fluvatile environment into a lacustrine environment. When reactions of each component of the fish population to the environmental transition were studied, profound changes in the relative abundance of many species were observed. The immediate changes were a decline in Mormyridae numbers, increases in numbers of Citharinidae (especially Citharinus citharus), Characidae (especially Hydrocynus forskali and Alestes baremose), Schilbeidae (especially Eutropius niloticus), and Lates niloticus; and a change in the relative abundance of various species of Mochochidae. After the lake had been in existence for a year, further recorded changes included a decline in numbers of Citharinidae (especially Citharinus citharus) and Lates niloticus, and increases in Characidae, Cichlidae (especially Tilapia galilaea), and clupeids. Overall population trends resulting from the lake's formation showed a decline in the number of bottom feeding insectivores, increase in the number of detritus feeders immediately after the lake was formed, followed by a decline; and an increase in numbers of planktivores, omnivores, and carnivores. The population changes had a number of features common to changes which occurred in other African man-made lakes. (Buchanan-Davidson--Wisconsin)
W75-11223

ACID STRIP MINE LAKE RECOVERY,
Missouri Univ., Columbia. Dept. of Civil Engineering.
D. L. King, J. J. Simmler, C. S. Decker, and C. W. Oze.
Journal Water Pollution Control Federation, Vol 46, No 1, p 2301-2315, 1974. 11 fig, 1 tab, 20 ref. OWRT A-038-MO(3).

Descriptors: *Strip mine lakes, *Neutralization, *Coal mine wastes, Productivity, Hydrogen ion concentration, Chemical reactions, Pyrite, Waste water treatment, Reduction(Chemical), Acid mine water, Mine acids, Clay minerals, Bacteria, Sulfur bacteria, Aluminum, Alkalinity, Bicarbonates, Vegetation effects, Nutrients, Reclamation, Organic matter, Hydrogen sulfide.
Identifiers: *Lake rehabilitation.

Acid strip mine lakes formed by oxidation of iron-sulfur pyrites and marcasites left on the surface after coal removal can be made alkaline and support aquatic communities. Factors aiding this recovery process are clay minerals, reaction with alkali metal compounds, activity of sulfate-reducing bacteria, creation of anaerobic conditions, reducing conditions, depth of water, light, aluminum concentration, and formation of bicarbonate alkalinity. The amount of vegetated land near the lake, seasonal changes in temperature, wind-induced mixing, time, bacteria, and algal nutrients are also important. Recovery can be accelerated by the addition of organic matter. The carbon:nitrogen:phosphate ratio should be considered in choosing the organic material to be used. The advantages of accelerating the recovery process would be elevation of pH, loss of acidity and metals, and use of organic wastes. The major disadvantage is evolution of hydrogen sulfide, which may be controlled by limiting the amount of organic matter added to the lake. The recovered strip mine lake will be in an early eutrophic state. The biological, chemical, and physical interaction from acid formation to a recovered lake could be avoided by covering acid-producing materials with non-acid soil when coal is strip-mined. (Buchanan-Davidson--Wisconsin)
W75-11224

THE GROWTH OF SOME EPIPHYTIC ALGAE IN A LAKE RECEIVING THERMAL EFFLUENT,
Alberta Univ., Edmonton. Dept. of Botany.
M. Hickman, and D. M. Klarer.
Archiv fur Hydrobiologie, Vol 74, No 3, p 403-426, 1974. 12 fig, 2 tab, 44 ref.

Descriptors: *Periphyton, *Algae, *Lakes, *Thermal pollution, *Canada, Bulrushes, Water temperature, Growth rates, Period of growth, Powerplants, Seasonal, Light intensity, Nutrients.
Identifiers: *Lake Wabamun(Alberta), Achnanthes minutissima, Oedogonium, Spirogyra, Gomphonema parvulum, Diatoma elongatum, Fragilaria capucina, Fragilaria vaucheriae, Stigeoclonium tenue, Cocconeis placentula, Gomphonema gracile, Epithemia turgida, Mougeotia.

Discharge of heated water into Lake Wabamun, Alberta, caused changes in the standing crop size of epiphyton associated with Scirpus validus and in the algal species composition. Seasonal growth cycles of twelve dominant species of epiphytic algae were studied using cell count data to determine effects of inflow of heated water on their growth. During winter in the heated areas nitrate-nitrogen, phosphate-phosphorus, and dissolved silica concentrations increased, reaching maximum levels in the spring, then decreased during ice break-up. The longer growing season was responsible for the early development and early spring maxima of Achnanthes minutissima, Oedogonium, Spirogyra, Gomphonema parvulum, Diatoma elongatum, Fragilaria capucina, and F. vaucheriae; extending autumn maximum of Stigeoclonium tunue into winter; and presence of large populations of Cocconeis placentula and Gomphonema gracile from autumn through winter. Heated water adversely affected growth of Epithemia turgida and Mougeotia and benefited growth of Spirogyra and Stigeoclonium tenue. Temperature alone did not account for all the differences when growth in heated and non-heated areas was compared; factors such as light intensity, daylength, and inorganic and organic nutrients in the water were also important. (Buchanan-Davidson--Wisconsin)
W75-11225

IN SITU MEASUREMENT OF THE SETTLING VELOCITY PROFILE OF PARTICULATE ORGANIC CARBON IN LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
N. M. Burns, and A. E. Pashley.
Journal of the Fisheries Research Board of Canada, Vol 31, No 3, p 291-297, 1974. 4 fig, 2 tab, 13 ref.

Descriptors: *Phytoplankton, *Settling velocity, Laboratory equipment, Particle size, Organic compounds, Carbon, Measurement, *Lake Ontario, On-site tests, Vertical migration, Thermocline, Epilimnion, Phosphorus, Nutrients.
Identifiers: *Organic carbon.

Calm water settling velocity profiles of particulate organic matter were measured using special sampling bottles. To determine phytoplankton settling velocity under natural conditions, species, light conditions, cell concentrations, growth rate, nutrient concentrations, cell physiological state, zooplankton grazing effects, and density stratification must be considered. The sampling bottles had a horizontal dividing shutter, two triggers sensitive to small and large diameter messengers, and a vane assembly and swivel clamp which enabled it to rotate freely on the mooring line to line up with the current and suffer minimum vibration due to vortex-shedding before retrieving the bottles. Samples were subdivided into upper and lower portions so settling velocities could be calculated. The settling velocity profile of Lake Ontario varied between -0.4 and +2.0 m/day. Net settling velocities measured at the top of the thermocline were used to estimate net settling fluxes from the epilimnion; these varied between -0.074 and +0.336 millimoles phosphorus/sq m/day. Net settling flux can differ from sedimentation flux out of the epilimnion. Negative settling can add nutrients to the epilimnion during the stratified period. Settling flux and diffusion flux have similar magnitudes, occasionally acting together or in opposition. (Buchanan-Davidson--Wisconsin)
W75-11227

A GENERAL DESCRIPTION OF THE OLIGOTROPHIC LAKE PAAJARVI, SOUTHERN FINLAND, AND THE ECOLOGICAL STUDIES ON IT,
Helsinki Univ. (Finland). Dept. of Botany.
R. Ruuhijarvi.
Annales Botanici Fennici, Vol 11, No 2, p 95-104, 1974. 4 fig, 4 tab, 39 ref.

Descriptors: *Lakes, *Europe, *Oligotrophy, *Humus, Trophic level, Hydrography, Lake morphometry, Geomorphology, Climatic data, Vegetation, Land use, Water chemistry, Forests, Aquatic plants.
Identifiers: *Lake Paajarvi(Finland).

Lake Paajarvi, a mesohumic, oligotrophic lake in southern Finland, has a maximum depth of 90 meters. Mineral bottoms predominate. It has two systems of shear zones and is located between two terminal-moraine systems of glacial origin. Ice covers the lake about 140 days a year. Its thermal structure is dimictic. The drainage basin lies in the southern boreal vegetation zone and consists of half coniferous forests plus cultivated land, peatlands, lakes, and deciduous forests. Agricultural

runoff and sewage are causing eutrophication. Only algae are present in the littoral-profundal zone. Floating-leaved plants cover 0.37% and submerged plants 10.9% of the lake. Isotherms show a long spring overturn, a stagnation period, and an autumnal drop in water temperature. Wind influences thermal stratification. Water level varies about 70 cm. Inflow of organic matter follows variations in stream discharge. Water chemistry measurements do not vary with season or stations. Inorganic carbon is higher and pH and oxygen saturation values are lower in the hypolimnion than epilimnion. Electrolytic conductivity and total phosphorus, potassium, and sodium contents are low, but nitrogen high. Lake Paajarvi is a relatively typical Finnish lake in its chemical properties. (Buchanan-Davidson--Wisconsin)
W75-11229

AN INVESTIGATION OF GLYCOLATE EXCRETION IN TWO SPECIES OF BLUE-GREEN ALGAE,
York Univ., Downsview (Ontario). Dept. of Biology.
K. H. Cheng, A. G. Miller, and B. Colman.
Planta (Berl.), Vol 103, p 110-116, 1972. 1 fig, 3 tab, 21 ref.

Descriptors: *Cyanophyta, *Anabaena, *Biochemistry, *Alcohols, Photosynthesis, Cytological studies, Carbon dioxide, Carbon cycle, Organic compounds.
Identifiers: *Glycolic acid, *Excretion, Glycolate.

The excretion of organic compounds by two species of filamentous blue-green algae during short periods of photosynthesis was studied by allowing the algae to assimilate radioactive bicarbonate. The amount of C14 glycolate excreted by Oscillatoria and Anabaena flos-aquae was less than 1% of the C14 fixed by the algae during photosynthesis. Transfer of cells grown on 5% carbon dioxide in air to a medium of low bicarbonate concentration or treatment of the cells with isonicotinyl hydrazide during photosynthesis caused little increase in glycolate excretion. Alpha-hydroxysulfonates failed to simulate massive excretion of glycolate. Although these blue-green algae excreted little glycolate, a significant proportion of the photosynthetically fixed carbon was excreted in the form of basic, neutral, and acidic compounds, and such excretion was greater in 5% carbon dioxide-grown cells than in air-grown cells. Amino acids made up the majority of labeled compounds excreted. The acid fraction consisted of residual bicarbonate, an unknown compound eluted with acetate, and glycolate. The usual pathway of glycolate utilization through glycine and serine did not appear to be very active in these algae. (Buchanan-Davidson--Wisconsin)
W75-11230

INFLUENCE OF OIL ON NUCLEIC ACIDS OF ALGAE,
Institute of Biology of The Southern Seas, Sevastopol (USSR).
I. A. Davavin, O. G. Mironov, and I. M. Tsimbal.
Marine Pollution Bulletin, Vol 6, No 1, p 13-15, 1973. 6 tab, 10 ref.

Descriptors: *Marine algae, *Plant physiology, *Biochemistry, *Oil pollution, Water pollution effects, Rhodophyta, Inhibitors, Organic acids, Oceans, Oil wastes, Organic compounds.
Identifiers: *Nucleic acids, Ribonucleic acid, Deoxyribonucleic acid, Ulva lactuca, Grateloupia dichotoma, Polysiphonia opaca.

The marine algae, Ulva lactuca, Grateloupia dichotoma, and Polysiphonia opaca, were exposed to Romashkinskaya oil and C14 labeled sodium carbonate. Deoxyribonucleic acid (DNA) separated from Ulva showed no substantial differences in degree of polymerization between stable and labile DNA. Activity increases in low polymer fragments indicated DNA depolymerization. Stable DNA was more resistant to oil and labile DNA more sensitive, possibly causing destruction of the mechanism of expression of heredity, synthesis of anomalous proteins, and death. Ulva DNA and RNA specific activities depended on length of exposure and oil concentration; increasing oil concentrations caused decreased specific activity. Complete inhibition of nucleic acid biosynthesis at high concentrations of oil occurred after 48-72 hours. With all algae there was simultaneous inhibition of DNA and RNA, but there were variations due to differences in their systemic positions and individual peculiarities. Oil pollution decreased RNA and DNA contents of red algae by inhibition of biosynthesis. It is concluded that the influence of oil on algae was due to modification of the degree of DNA polymerization and inhibition of DNA and RNA biosynthesis, thus reducing the nucleic acid content. (Buchanan-Davidson--Wisconsin)
W75-11232

MAN'S IMPACT ON A NEWLY FORMED RESERVOIR,
New Mexico Univ., Albuquerque. Dept. of Biology.
E. W. Hansmann, D. E. Kidd, and E. Gilbert.
Hydrobiologia, Vol 45, No 2-3, p 185-197, 1974. 6 fig, 5 tab, 9 ref. NSF GI-29422.

Descriptors: *Reservoirs, *Eutrophication, *Productivity, *Recreation, *Colorado River, Arizona, Utah, Climatic data, Geomorphology, Seasonal, Annual.
Identifiers: *Lake Powell(Ariz-Utah).

The impact of recreation on eutrophication was studied in the Lake Powell Reservoir which resulted from the Glen Canyon Dam built on the Colorado River at the Arizona-Utah border. Water quality was determined by measuring primary net productivity using C12. Recreational activities in the Wahweap area had a stimulating effect on net productivity and eutrophication of the area compared to other sites, especially during the summer season. Higher production at the Navajo site during the winter season did not appear to be related to recreational activities thus must be assumed to be due to natural unknown abiotic conditions. Lake Powell can be classified as a naturally eutrophic body of water with a mean production rate at its lower end of 645.7 mg/C12/sq m/day. It is not known if the complete Lake Powell system is naturally eutrophic or only the area under study. The results are undoubtedly an underestimation of the total carbon production of the area. Benthic primary communities have been observed in several bays and canyons and must be accounted for in analyzing the results. (Buchanan-Davidson--Wisconsin)
W75-11233

EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. IV. FEEDING OF INTRODUCED AND AUTOCHTHONOUS NON-PREDATORY FISH,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
A. Prejs.
Ekologia Polska, Vol 21, No 31, p 465-503, 1973. 8 fig, 12 tab, 81 ref.

Descriptors: *Fish management, *Fish stocking, *Fish diets, Fish food organisms, Carp, Fish populations, Spatial distribution, Competition, Herbivores, Feeding rates, Benthic fauna, Zooplankton, Aquatic plants, Europe.
Identifiers: *Lake Warniak(Poland), Bream, Roach, Tench.

Introduction of carp and bream into a shallow, eutrophic lake, the effect of the considerably increased and changed fish stock on the biocenosis of the water body, and the practical aspects of fishery management were studied. Studies on the feeding of non-predatory fish dealt with food composition of introduced fish and of dominant autochthonous non-predatory species; feeding intensity of examined species; analysis of food relations in the changed community of non-predatory fish due to introduction of new species. Carp, bream and tench feed mainly on bottom fauna and fauna associated with plants; crucian carp feed on zooplankton, and roach prefer plant food, with macrophytes the first choice. In the years of studies, together with the increase of fish stock their grazing intensity decreased and their feeding habits changed. In the year with the most numerous fish stock the introduced species (carp and bream) ate about 60% of the bottom fauna biomass and fauna associated with plants; about 30% of zooplankton biomass was consumed by the whole community of non-predatory fish. Data on the differentiation of the distribution of basic feeding grounds of particular fish species are presented. (Jones-Wisconsin)
W75-11234

A CONTRIBUTION TO THE BIOLOGY OF NITELLA HOOKERI A. BR. IN THE ROTORUA LAKES, NEW ZEALAND. II. ORGANIC NUTRIENTS AND PHYSICAL FACTORS,
Auckland Univ. (New Zealand). Dept. of Botany.
M. B. Starling, V. J. Chapman, and J. M. A. Brown.
Hydrobiologia, Vol 45, No 2-3, p 157-168, 1974. 5 fig, 2 tab, 21 ref.

Descriptors: *Algae, *Chara, *Nutrient requirements, *Growth rates, Cultures, Vitamins, Weight, Water temperature, Light intensity.
Identifiers: *Nitella hookeri, *Rotorua Lakes(New Zealand), Thiamine, Pyridoxin, Nicotinamide, Cobalamin, Riboflavin, Biotin, Ascorbic acid, Giberellic acid, Kinetin, Indole acetic acid.

Growth of Nitella hookeri A. Br. in non-axenic cultures, with or without soil extract, is not significantly stimulated by addition of most vitamins, coenzymes, and growth hormones. Thiamine, pyridoxin, and nicotinamide increased growth slightly but only at concentrations greater than those found under field conditions. Kinetin inhibited growth. Nitella propagules are not typical adult vegetative cells in their responses but form naturally in the lakes so may indicate possible factors governing growth for certain periods of the year. The best growth measured by linear increment, dry weight, and fresh weight was at 17C; growth ceased at 10C or 25C. Growth increased with increased light intensities, but 600 lux for a 12-hour day appeared to be the best long term condition. However growth responses to varying temperature and light conditions were confused thus a more rigid growth assessment is needed. The same general trends were observed in these experiments as were observed under natural conditions in the New Zealand Rotorua Lakes and help explain the natural distribution of Nitella in these lakes. However winter growth occurs at a temperature of about 10C in these lakes, indicating that laboratory culture conditions have not defined all growth factors. (Buchanan-Davidson--Wisconsin)
W75-11235

SEASONAL ABUNDANCE OF CRUSTACEAN ZOOPLANKTON AND NET PLANKTON BIOMASS OF LAKES HURON, ERIE, AND ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
N. H. F. Watson, and G. F. Carpenter.
Journal of the Fisheries Research Board of Canada, Vol 31, No 3, p 309-317, 1974. 2 fig, 5 tab, 15 ref.

Descriptors: *Seasonal, *Zooplankton, *Plankton, *Biomass, *Lake Erie, *Lake Huron, *Lake Ontario, Microorganisms, Fluctuations, Spring, Summer, Autumn, Cladocera, Copepods, Phytoplankton, Dominant organisms, Crustaceans, Shallow water, Littoral, Varieties, Great Lakes, Daphnia.

Crustacean zooplankton and net plankton biomass changed from April to December in Lakes Huron, Erie, and Ontario. Species were generally identical but times of maxima and relative species composition differed. Net biomass changes were due to changes in species composition, total crustacean numbers and phytoplankton quantities. Numbers were lower in the main part of Lake Huron than Lake Ontario, but net biomass values were equal or greater than those in Lake Ontario open waters because the organisms were larger and net phytoplankton amounts differed. Crustacean concentrations and biomass were highest in inshore water in all lakes, but fluctuated more than in offshore areas, especially in Lake Huron. Fluctuations in crustacean numbers were related to seasonal cycles of cladocerans and cyclopoid which often had summer maxima. Calanoids had more stable numbers. Biomass fluctuations were related to phytoplankton blooms. Calanoid copepods were most abundant and diverse in Lakes Huron and western Lake Erie, and cyclopoids and cladocerans in Lakes Erie, Ontario, and Saginaw Bay of Lake Huron. Diacyclops bicuspidatus thomasi was the most abundant cyclopoid all year in all lakes, Tropocyclops prasinus in Lake Ontario, and Acanthocyclops vernalis in Lake Erie. Cladocerans were most numerous in Lakes Erie and Ontario. (Buchanan-Davidson--Wisconsin)
W75-11238

EFFECTS OF OZONE-TREATED SEAWATER ON THE SPAWNED, FERTILIZED, MEIOTIC, AND CLEAVING EGGS OF THE COMMERCIAL AMERICAN OYSTER,
S. A. Maclean, A. C. Longwell, and W. J. Blogoslawski.
Mutat Res, Vol 21, No 5, p 283-285, 1973.

Descriptors: Water pollution effects, *Ozone, *Oysters, Sea water, *Spawning, *Fertilization, Commercial shellfish, *Fish eggs.
Identifiers: *American oyster eggs, Crassostrea-virginica, Parthenogenesis, Protoplasm, Meiotic eggs(Oysters).

Fertilization of Crassostrea virginica eggs occurred less readily in O3 treated water, as evidenced by a decrease in polyspermy and an increase in parthenogenesis. Larger numbers of eggs retarded in their completion of meiosis were noted and there was an increased incidence of abnormal polar bodies in the ozonized water. Most prominent in the O3-treated water were the large numbers of cleaving eggs with abnormal nuclei. The decomposition of ozone in water produces the same positive radicals (OH and HO2) generally considered the biologically active products of irradiation of protoplasm and the cytological and cytogenetic effects of ozone appear radiomimetic.--Copyright 1974, Biological Abstracts, Inc.
W75-11256

ACUTE TOXICITY OF PETROCHEMICAL DRILLING FLUIDS COMPONENTS AND WASTES TO FISH,
Fisheries and Marine Service, Winnipeg (Manitoba). Resource Management Branch.
M. R. Falk, and M. J. Lawrence.
Technical Report Series No CEN-T-73-1, April, 1973, 108 p. 9 fig, 10 tab, 7 ref.

Descriptors: *Toxicity, *Drilling fluids, *Rainbow trout, Fish, Lethal limit, Pollutants, Water pollution effects, Oil fields, Oil wells, Water wells, Mud, Slurries, Wells, Bentorite, Bicarbonate, Potassium compounds, Waste disposal, Sumps, Drainage, Surface water.
Identifiers: *Lake chub(Fish), *Lignosulfate, *Barium sulfate, Waste containment.

A study conducted in 1972 consisted of a field program to acquire information on the nature and amounts of drilling fluid compounds used, the efficiency of waste containment facilities and on toxicities of drilling and sumps fluids, and a laboratory phase to determine acute toxicities of drilling fluids and their constituent chemicals. Drilling fluids were acutely toxic to lake chub and rainbow trout with 96 hour LC50's of 0.83 to 12.0 percent. Sump fluids were less toxic with one sump yielding 96 hour LC50's of 22.5 and 81.0 percent for composite and surface sump fluids, respectively. Out of 27 common components of drilling fluids, seven were toxic and six were moderately toxic. The field program was conducted in the Mackenzie delta area, Northwest Territories, Canada. Recommendations on waste containment, treatment and future studies are given. A brief description of the nature and function of drilling fluids and their constituent chemicals is also included. (Bradbeer-NWWA)
W75-11265

THE TOXICITY OF DRILLING FLUID COMPONENTS TO AQUATIC BIOLOGICAL SYSTEMS, A LITERATURE REVIEW,
Fisheries and Marine Service, Winnipeg (Manitoba).
B. Land.
Technical Report No 487, 1974. 33 p, 8 tab, 58 ref.

Descriptors: Publications, *Reviews, *Bibliographies, *Data collections, *Toxicity, *Fish, *Drilling fluid, Marine biology, Aquatic animals, Suspended solids, Suspended load, Environment, Pollution, *Water pollution effects, Surface waters.
Identifiers: Barite, Lignosulphate.

A literature review is presented on the toxicity to aquatic biological systems of drilling fluid components in northern Canada. This review includes aquatic toxicity literature that was available prior to January 31, 1974. The components of drilling fluids include suspended solids, chlorides, alkaline sources, chromium compounds, bactericides, organic polymers, dispersants, defoamers, lubricants and detergents. On the basis of quantities used and of the harmful long-term effects produced, the alkaline sources, bactericides, barium sulphate, bentonite, chromium salts and potassium chloride compromise the major sources of aquatic toxicity. (Bradbeer-NWWA)
W75-11266

FERTILIZER PHOSPHATE IN STREAMS AND LAKES,
Canberra Coll. of Advanced Education (Australia).
For primary bibliographic entry see Field 5B.
W75-11310

NATURAL AND FERTILIZER NITROGEN IN STREAMS AND LAKES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.
For primary bibliographic entry see Field 5B.
W75-11311

SEASONAL ABUNDANCE AND DIVERSITY OF BENTHOS IN A SOUTHERN ILLINOIS, USA SWAMP,
Central Michigan Univ., Mt. Pleasant. Dept. of Biology.
For primary bibliographic entry see Field 2H.
W75-11312

GUIDELINES FOR THE IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS IN THE CONSTRUCTION AND OPERATION OF A RESERVOIR,
Illinois Univ., Urbana. Dept. of Forestry.
F. L. Johnson, and D. T. Bell.
Research Report No. 75-6, June 1975. 36 p, 2 fig, 52 ref.

Descriptors: *Reservoir construction, *Reservoir operation, *Environmental effects, Air pollution effects, Microclimatology, Soil properties, Ecology, Wildlife, Vegetation, Groundwater, Surface waters, Water quality, Land forming, Recreation, Natural resources, Aesthetics, Reservoirs, Construction, Operations.

This guide summarizes how the construction and operation of a reservoir will affect the attributes of the biophysical environment. The latter include: air quality, microclimate, soil conditions, ecological relationships, fauna, flora, groundwater hydrology, surface water, land forms and processes, outdoor recreation, preservation of natural resources, special interest areas and sites, aesthetics, and surface water quality. Construction operations and associated activities are outlined and described. (Witt-IPC)
W75-11316

EFFLUENT CHARACTERISTICS AND TREATMENT OF MECHANICAL PULPING EFFLUENTS,
B.C. Research, Vancouver(British Columbia).
For primary bibliographic entry see Field 5D.
W75-11331

5D. Waste Treatment Processes

PHYTOPHTHORA SPECIES IN ARIZONA: ITS OCCURRENCE IN RECYCLED IRRIGATION WATER,
California Univ., Berkeley. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5A.
W75-10883

ORGANIC COLOR IN GROUNDWATER OF MISSISSIPPI,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W75-10907

REVIEW OF CONFERENCE ON HYDROLOGY OF DEEP SEDIMENTARY BASINS,
Tulsa Univ., Okla. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W75-10935

AN APPRAISAL OF POTENTIAL WATER SALVAGE IN THE LAKE MCMILLEN DELTA AREA, EDDY COUNTY, NEW MEXICO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 3B.
W75-10941

PILOT-PLANT STUDY OF DENITRIFICATION USING A SUBMERGED SAND FILTER AT RYE MEADS SEWAGE WORKS,
B. Collinson.
Water Pollution Control, Vol 73, No 6, p 685-692, 1974. 6 fig, 3 tab, 19 ref.

Descriptors: *Waste water treatment, *Filters, *Nitrates, *Sewage treatment, Effluents, Pilot plants, Runoff, *Denitrification, Anaerobic treatment, Filtration.
Identifiers: Auto analyzer, Rye Meads(Gt Brit), Submerged sand filter.

The reduction of nitrate from all sources in the River Lee at Chingford, Great Britain was investigated. Major sources of nitrate are sewage effluent, drainage and surface runoff from agricultural land. Of the possible methods of nitrate reduction, removal from effluent by the addition of a methanol carbon source and an anaerobic flooded sand filter was chosen. A pilot plant study at the Rye Meads Sewage Works used a Sub-

merged sand filter for sewage effluent treatment. Analysis of amm. N, chloride, phosphate, anionic synthetic detergents and nitrate were made using an Auto Analyzer. No significant differences in these between the work's effluent or the denitrified effluent were found. Suspended solids were reduced from 10 mg/liter to 5 mg/liter by passage through the sand filter. The COD values obtained were used as an indication of residual methanol. The methanol requirement is dependent upon nitrate concentration and continuous monitoring of nirtate would be necessary for a large scale plant. During seven months of testing the dentrification unit, it was shown that 96 percent of nitrate-N was removed from approximately 8000 liters per day of effluent with a contact period of seven minutes and 100 mg/liter of methanol added as a carbon source. The Rye Meads Works is amenable to denitrification using this process. Further plans include modification of the existing rapid-gravity sand filter, enabling up to 4540 cu m effluent per day to be denitrified. (Prague-FIRL)
W75-10955

WATER AND WASTEWATER DISINFECTION WITH OZONE: A CRITICAL REVIEW,
Cincinnati Univ., Ohio.
R. N. Kinman.
CRC Critical Reviews in Environmental Control, p 141-152, January, 1975. 2 fig, 3 tab, 17 ref.

Descriptors: *Ozone, *Waste water treatment, *Water treatment, Chlorine, Costs, Biochemical oxygen demand, Municipal water, Potable water, Toxicity, Environmental effects, Design criteria, Treatment facilities, Monitoring, *Reviews, *Disinfection.

Technical literature on ozone disinfection, as an alternative to chlorine, is reviewed. General statements made include: ozone is a powerful bactericide and a powerful virucide in water or waste water; most waters and waste waters require a higher amount of ozone than chlorine on a mg/liter basis to accomplish the same disinfection; costs of disinfection with chlorine are lower than those ozone. Also, ozone will probably not be widely used in the United States for municipal water disinfection unless the requirement in most states for residual disinfectants in the water after a specific contact time is changed, and unless cost is not considered as the major design consideration. Ozone disinfection may be implemented as a unit process in waste water reclamation plants for potable reuse application. Additional research on ozone as a disinfectant was suggested in the areas of: disinfection efficiency against organisms not yet studied; new contacting schemes to reduce capital costs and increase mass transfer; ozone measuring and monitoring systems; ozone production equipment; toxicity of ozonation products in disinfected water; physiological effects of low concentrations of ozone to man; and, BOD5, COD, and TOC relationships in ozone disinfection. (Prague-FIRL)
W75-10956

POPULATION DYNAMICS OF PROTOZOA IN WASTEWATER,
Howard Univ., Washington, D.C. Bioenvironmental Engineering and Sciences Research Lab.
M. M. Varma, H. E. Finley, and G. H. Bennett.
Journal Water Pollution Control Federation, Vol 47, No 1, p 85-92, January, 1975. 5 fig, 2 tab, 20 ref.

Descriptors: *Waste water treatment, *Bacteria, *Biological treatment, *Protozoa, Digestion, Laboratory investigations, Microorganisms, Clarification, Municipal wastes, *District of Columbia, Pollutant identification.
Identifiers: Opercularia, Vorticella, Protozoa population dynamics, Blue Plains Treatment Plant, Washington, DC.

A study was conducted to identify the dominant protozoa in the various parts of the waste water treatment processes of the Blue Plains Treatment Plant, Washington, D.C. Its second objective was to observe the dominant protozoa in the secondary effluent, within laboratory conditions simulating the plant, in order to determine whether or not the populations are influenced by environmental factors. Finally, the laboratory equipment simulating plant conditions was seeded with two peritrichs, Vorticella and Opercularia, and the common bacteria from the plant effluent; buffers and organic nutrients, sucrose and glutanic acid, were then added to determine whether these additives affected the growth of the protozoan populations. From the investigations, the relative importances of bacteria and protozoa was waste water treatment were examined. It was concluded that Vorticella, which is responsible for clarification, is dominant in secondary effluent. The death rate of Opercularia was not significantly affected by pH changes, while the Vorticella population was more sensitive to such changes. Also, when glutamic acid was added, the Opercularia population increases in number. These findings indicate that further tests should be made to determine the optimum protozoa:microorganism ratio at various substrate concentrations existing in a treatment plant. Tests are necessary to compare catalase activity with the ratio and also to determine whether the bacteria are dead or alive when they are digested by protozoa. (Prague-FIRL)
W75-10957

THE MECHANISM OF FLOCCULATION PROCESSES IN THE PRESENCE OF HUMIC STUBTANCES,
Technion - Israel Inst. of Tech., Haifa.
N. Narkis, and M. Rebhun.
Journal of the American Water Works Association, Vol 67, No 2, p 101-108, February, 1975. 8 fig, 19 ref.

Descriptors: *Organic compounds, *Flocculation, *Waste water treatment, Polyelectrolytes, Cations, Anions, Suspended solids, Biological treatment, Fulvic acids, Humic acids, Colloids, Organic acids.
Identifiers: Organo-clay complexes.

The mechanism of flocculation is detailed for a system with organic matter, particularly with clay suspensions interacting with humic and fulvic acids. A radioactively labelled cationic polyelectrolyte was used to facilitate this study. The phenomenon of flocculation is similar in any system where suspended solids interact with dissolved organic matter, such as in raw sewage or effluents from biological treatment plants. It was demonstrated that the salts of humic and fulvic acids, which are anionic polyelectrolytes, react chemically with the polycationic flocculant through carboxylate and phenolate groups and thus form colloidal-reaction-product flocculates which are removed by settling. In this case, a cationic polyelectrolyte was added to an organo-clay complex suspension dispersed in humate or fulvate solution. The polyelectrolyte was shown to react first with free humates and fulvates and only after the complete reaction with free organic acids did flocculation of the suspension occur. Because the presence of organic matter in solution or as a complex on the mineral clay particle surface inhibits the process of flocculation, large doses of the flocculant are necessary to produce reaction conditions favorable for complete reaction. (Prague-FIRL)
W75-10958

OZONE TREATMENT LICKS COLOR PROBLEM.
Water and Sewage Works, Vol 122, No 4, p 52-54, April, 1975. 3 fig.

Descriptors: *Waste water treatment, *Water supply, *Ozone, *Chlorination, *Treatment facilities, Color, Odors, Filtration.
Identifiers: *Color removal, Watchgate Treatment Works(Gt Brit), Ozonization.

The scheme of water supply treatment for the city of Manchester, England, and the Watchgate Treatment Works is described. The Works consists of Five units--control, filter, washwater, contact tank, and ozone. Basic treatment involves rapid gravity filtration, super-chlorination and contact, pH correction, and chlorine residual control of the finished waters. A basic problem in the system was color reduction, associated with removal of particulate matter and sterilization. Water from Windermere and Haweswater, two of four sources, had color up to 7 degrees and 30 degrees Hazen respectively. Required characteristics of the treated water are pH 7.5 to 8.0, color less than 5 degrees Hazen, and turbidity less than 2 ppm. To remove color from the Haweswater water, pretreatment by filtration and chlorination is followed by ozonization in three separate streams. The use of ozone is particularly suited to the limited head available throughout the plant. Ozone may also be used to sterilize Haweswater water if chlorine is not available, and to control tastes and odors when required. A plan of the Watchgate Treatment Works is detailed, whereby the ozone unit may be utilized or by-passed. The layout includes administrative offices, Laboratories, a control room, an equipment room, and chemical storage facilities; the site provides for alternative treatment methods. (Prague-FIRL)
W75-10959

FIRST STAGE OF THE WORLD'S LARGEST PURE OXYGEN SEWAGE PLANT TO UNDERGO TEST.
Engineering News-Record, Vol 194, No 2, p 16-17, January 9, 1975.

Descriptors: *Oxygen, *Aeration, *Sewage treatment, Pilot plants, Municipal wastes, Treatment facilities, *Waste water treatment, Michigan, Oxygen.
Identifiers: *Detroit(Mich), Hydrocarbons.

The Detroit Metro Water Department, of Detroit, Michigan, has built a 300-mgd pure oxygen treatment system for municipal wastes. A 600-mgd capacity additional facility is under construction for 1977, which will make the system the world's largest pure oxygen plant. The system was chosen on the basis of space considerations, successes with pure oxygen aeration elsewhere, and tests with a 100,000 gpd pilot plant. The new system has been tested to be capable of reducing BOD and suspended solids in effluent to 20 ppm, which is below the design goal of 30 ppm. Two identical aeration tanks were built five years ago at the projects inception, one with oxygen and one with air equipment. In July, a comparison will be made, and it is hoped that the air system will be converted to oxygen. The new installation needs only 48% of the air system's power because the partial pressure of oxygen in air is 160 mm of mercury, whereas the partial pressure of pure oxygen is 760 mm. Thus, a pure oxygen system has almost five times the internal driving force of an air system, requiring less pumps, condensers, and mixers. The system, including the Detroit plant's high-capacity final clarifiers should cut operating and capital costs by $21 per million gallon each year. Because the Detroit plant is landlocked, the sewage plant has installed deep tanks to conserve space. Other design considerations include air sampling for automatic shutdown should volatile hydrocarbons in sewage, reach 20% of their explosive limit. Further tests will demonstrate the systems operation in cold weather. (Prague-FIRL)
W75-10960

SOME STUDIES ON NITRIFICATION IN THE ACTIVATED SLUDGE PROCESS,
Sheffield Water Pollution Control Dept. (England).
I. R. Hall.
Water Pollution Control, Vol 73, No 45, p 538-547, 1974. 4 fig, 2 tab, 22 ref.

Descriptors: *Waste water treatment, *Nitrification, *Sewage treatment, Ammonia, Industrial wastes, Toxicity, Activated sludge, Hydrogen ion concentration.
Identifiers: Ammonia removal, Nitrosomonas.

Nitrification in the activated sludge plant for removing ammonia at Sheffield's Blackburn Meadows sewage works was investigated. This sewage contains about 25 percent industrial waste water, including metal finishing wastes. It was thought that nitrification would be the most economical method of removing ammonia. Results of experimental testing showed that sewage from this plant can be consistently nitrified using the activated sludge method. The rates of growth of Nitrosomonas in activated sludges grown on an industrial and domestic sewage, when ammonia was not rate-limiting, were higher than those reported elsewhere for low temperature domestic sewage. The pH value for nitrification was always above 6.3 and nitrifying activity of activated sludges was independent of pH value in the range of 7 to 9. Discussed also was a simplified method to predict whether nitrification will occur, from consideration of either sludge loading or sludge wastage. In addition, it was suggested that new discharges to sewers be screened for potential toxic hazards. (Prague-FIRL)
W75-10961

PRESERVING ACTIVATED SLUDGE,
Wiggins-Rimer and Associates, Durham, N.C.
J. A. Nissen, and P. A. Vesilind.
Water and Sewage Works, Vol 121, No 8, p 48-52, August, 1974. 7 fig, 5 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Preservation, Analysis, Analytical techniques, Testing, Biodegradation, Sludge digestion, Microbial degradation.
Identifiers: *Formaldehyde.

Many problems result when the sludge from pilot or bench-scale experiments is transported to consultants, equipment manufactures, or commercial laboratories for analysis. A cheap, readily available method of preserving waste water sludges is needed that is capable of stopping all biological action, without changing the physical characteristics of aerobic or anaerobic sludge. The preservative agent should possess the following attributes: be able to kill the types of organisms found in biological sludge before biological action can alter the physical characteristics of the sludge; the physical structure of the cells killed should not be changed by the action of the preservative; the required dosage should not be large enough to significantly dilute the sample; the preservative should not be hazardous to humans; and, the preservative should be economical and readily available. As a result of the experiments performed, formaldehyde is considered an acceptable preservative for activated and digested sludge. Dosages sufficient to effectively kill activated sludge organisms are in the range of 0.5-1.0 percent commercial grade formaldehyde (by volume). Activated sludge which undergoes anaerobiasis and becomes anaerobic demonstrates much better settling characteristics and a lower viscosity than the fresh or preserved sludge. Digested sludge organisms were found to be sensitive to very small dosages of formaldehyde. Small dosages of formaldehyde do not significantly change the physical nature of digested sludge or interfere with the action of chemical conditioners. (Orr-FIRL)
W75-10962

DISINFECTING WASTEWATER WITH CHLORINATION/DECHLORINATION PART 1,
G. C. White.
Water and Sewage Works, Vol 121, No 8, p 70-71, August, 1974. 1 fig.

Descriptors: *Waste water treatment, *Chlorination, *Coliforms, *Disinfection, Chemical reactions, Mathematical models, Biochemical oxygen demand, Suspended solids, Chemistry, Potable water, Water treatment, Sewage treatment.

The disinfection of waste water is an important in waste water treatment as BOD, suspended solids, and grease removal. The chemistry of waste water chlorination is described. When a chlorine solution from a conventional gas chlorinator enters the waste water stream the reaction that takes precedence over all others is the reaction between free chlorine and ammonia nitrogen to form chloramine and water. This reaction is 99% complete in a fraction of a second at 60-65F and pH 7.5. The mechanism of disinfection is generally accepted to be penetration through the cell wall of the microorganism by the chlorine compound and a chemical reaction between the compound and the vital parts of the microorganism so that reproduction is ended. When potable water is chlorinated that contains only an excess of ammonia nitrogen, the resulting compounds are almost all monochloramines. However, if organic nitrogen is present in amounts greater than 0.15 mg/liter, dichloramine begins to form. This compound or similar compounds have a poisoning effect on chlorine residuals that are only a few minutes old and for this reason back-mixing or short circuiting in a chlorine contact chamber should be avoided. The mathematics of the most probable number (MPN) of coliform concentration from a quantitative viewpoint is presented. The following equation was developed from a pilot plant system that had excellent mixing: y=y sub o (1 + 0.23 ct) where y=MPN in chlorinated waste water at end of time t; y sub o=MPN in effluent prior to chlorination; c=total chlorine residual in mg/liter; and, t=contact time in minutes. This mathematical model illustrates the importance of waste water quality on the attainment of a low coliform concentration. (See also W75-10964) (Orr-FIRL)
W75-10963

DISINFECTING WASTEWATER WITH CHLORINATION/DECHLORINATION PART 2,
G. C. White.
Water and Sewage Works, Vol 121, No 9, p 93-95, September, 1974. 1 fig.

Descriptors: *Chlorination, *Disinfection, Equipment, *Wastewater treatment, *Potable water, Control, Water purification, Water treatment, Sewage treatment, Water quality control.

The three major factors that account for the difference in the sensitivity between potable water and waste water to the disinfection process by chlorine are the magnitude of coliform concentration prior to chlorination, the ammonia nitrogen content, and the relatively high organic nitrogen content in waste water effluents. The most efficient chlorination disinfection systems studied had four attributes in common: very good initial mixing; sufficient contact time (at least 30 min. at peak flow) in an outfall conduit or a well designed basin; a good automatic chlorine residual control system; and, competent operating personnel. Mixing should ideally be completed in a fraction of a second. In actual operation, mixing completed within one to three seconds is considered excellent. A tubular type of reactor or a closed conduit are both good mixing devices. A chlorine contact chamber should provide sufficient residence time for the chlorine to reduce the harmful and objectionable microorganisms to acceptable levels. Closed conduits are the best contact chambers followed by long narrow outfall channels as the second best type. There are two types of chlorine residual control systems: straight residual control where the analyzer controls both the change in flow rate and chlorine demand of the waste water; measuring device and from a residual analyzer. The compound loop system is recommended because of its ability to cope with sudden changes in flow. (See also W75-10963) (Orr-FIRL)
W75-10964

NITROGEN REMOVAL BY CATALYST-AIDED BREAKPOINT CHLORINATION,
Environmental Quality Research and Development Unit. New York State Dept. of Environmental Conservation, Albany.
W. N. Stasiuk, L. J. Hetling, and W. W. Shuster.
Journal Water Pollution Control Federation, Vol 46, No 8, p 1974-1983, 1974. 7 fig, 2 tab, 10 ref.

Descriptors: Nitrogen, *Ammonia, *Algae, *Chlorination, *Waste water treatment, Water pollution, Nitrification, Denitrification, Ion exchange, Oxidation, Activated carbon, Nitrogen compounds, Nutrient removal, Adsorption.
Identifiers: Chloramine formation, *Breakpoint chlorination, Air stripping, Nitrogenous oxygen demand, Trichloramine, Monochloramine, Dichloramine, *Nitrogen removal.

Under certain conditions, the removal or conversion of nitrogenous species in waste waters is necessary. Ammonia must be removed to a form with no direct oxygen demand when ammonia nitrogen exerts a large drain on the oxygen resources of the receiving waters. When the nutrient that limits algae growth is nitrogen, removal is needed to eliminate nuisance algal blooms. Methods developed for the conversion, reduction, or removal of ammonia nitrogen in waste waters include biological nitrification-denitrification, selective ion exchange, air stripping at elevated pH, and breakpoint chlorination. A technique for reducing nitrogenous oxygen demand submitted to the New York State Department of Environmental Conservation utilized adsorption of chloramines on activated carbon. Chloramines are formed in chlorinated waters containing ammonia and hypochlorous acid. Previous chloramine formation studies were handicapped by the occurrence of decomposition reactions at low, pH, as well as Cl:N ratios greater than 5. These consisted of the loss of oxidizing chlorine and ammonia nitrogen, and are called breakpoint chlorination reactions. An advantage would be realized if monochloramine were adsorbed on activated carbon. The theoretical Cl:N ratio for 100 per cent removal of ammonia would decrease from 76:1 for breakpoint to approximately 5:1 for the formation of monochloramine to be adsorbed on the carbon. (Leibowitz-FIRL)
W75-10965

DEWATERS SLUDGE.
Water and Wastes Engineering, Vol 11, No 8, p 45, August, 1974. 1 fig.

Descriptors: *Sludge, *Dewatering, Water pollution control, *Centrifugation, Industrial wastes, Municipal wastes, Commercial wastes, *Waste water treatment, Alum, Activated sludge, Equipment.
Identifiers: Sludg-a-Tron.

A centrifuge called the Sludg-a-Tron is being utilized in pollution control and processing services for dewatering and concentrating a wide range of industrial, municipal, institutional and commercial sludge wastes. The centrifuge is able to concentrate sludges from one percent, solids up to 35 percent solids by weight and higher, treating aerobically digested sludges, biological sludges, waste activated sludges, water treatment alum sludges, and other industrial wastes. The Sludg-a-Tron is expected to be broadly utilized in waste treatment facilities on two-stage dewatering systems. A high solids capture rate, with efficiencies ranging up to 99 percent, is achievable without the use of polyelectrolytes or flocculants. The centrifuge can achieve a uniformity of cake, and a high degree of cake compaction, without regard to feed rate or composition. Some advantages listed are maximum installation space, low operating speed, minimum power requirements, design simplicity, choice of driving arrangements, and a large range of options and accessories. (Leibowitz-FIRL)
W75-10966

WASTEWATER TREATMENT USING ALGAE AND ARTEMIA,
Illinois State Univ., Normal. Coll. of Applied Science and Technology.
A. R. Jacobson.
Public Works, Vol 105, No 10, p 114, October, 1974.

Descriptors: *Eutrophication, *Organic wastes, *Algae, *Artemia, *Waste water treatment, *Sewage treatment, Aeration, Tertiary treatment.
Identifiers: Raw wastes, Mariculture.

A new system of controlled eutrophication for either waste water or high organic wastes was investigated. Laboratory studies used Chlorella and Tetraselmis algae in conjunction with Artemia salina (brine shrimp) to provide controlled purification of raw and treated waste. Artemia could be adapted to live in secondary treated waste with no aeration, raw waste with aeration, or raw waste in which Tetraselmis or Chlorella had bloomed. The optimal treatment for raw waste was: algal growth with artificial light; addition of Artemia; decantation, followed by additional algal growth; and, final decantation. Sanitary chemical methodology was used to determine parameters of total suspended solids, biochemical oxygen demand, turbidity, odor, orthophosphate, nitrate, nitrite, and ammonia. All of these parameters were reduced by the process to levels associated with at least conventional secondary treatment and possibly tertiary treatment. Implications of mariculture were also discussed. (Prague-FIRL)
W75-10967

TEMPERATURE EFFECTS ON MICROBIAL GROWTH IN CSTR'S,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering.
R. E. Muck, and C. P. L. Grady.
Journal of the Environmental Engineering Division, Vol 100, No EE5, p 1147-1163, October, 1974. 6 fig, 5 tab, 33 ref.

Descriptors: *Waste water treatment, *Temperature, *Biological treatment, Engineering, *Microbial degradation, Microorganisms, Laboratory tests, Nutrient removal, Bacteria, Growth rates.
Identifiers: Continuous Stirred Tank Reactors.

In order to apply sound engineering judgment to decisions concerning biochemical processes, including the removal of soluble organics in waste water treatment, it is necessary to quantify the effects of various parameters acting upon them. The effects of temperature upon the four parameters which describe the continuous of growth of a natural microbial population in a Continuous Stirred Tank Reactors (CSTR's) are discussed. Results of the laboratory studies conducted showed that the maximum specific growth rate constant and the bacterial decay rate constant increased with increases in temperature according to the Arrhenius equation over the temperature range of 10 C-30C. The ratio of the temperature characteristics for decay to that for growth was 1.11. The true growth yield was observed to increase as the temperature was increased from 10C to 20C, but to decrease with further rises in temperature. The saturation constant decreased slightly when the temperature rose from 10C to 20C, and then rose greatly when the temperature was increased to 30C. The results of the study agree with the findings of other workers as reported in the literature. It seems that the physical characteristics of the experimental system may have some effects on the effects of temperature on the saturation constant. The system-descriptive parameters analyzed are independent of the operational conditions imposed on waste water treatment systems. By utilizing the equations presented, design engineers can choose the proper treatment conditions for an effluent without having to rely on generalizations about the effects of temperature on plant performance. (Orr-FIRL)
W75-10968

SLURRY DELIQUORING BY EXPRESSION,
Nagoya Univ. (Japan). Dept. of Chemical Engineering.
M. Shirato, T. Murase, and T. Aragaki.
Dechema Monographien, Vol 74, No 1432/1451, p 9-39, 1974. 27 fig.

Descriptors: *Separation techniques, *Sewage treatment, *Waste water treatment, Sewage sludge, Equations, Filtration.
Identifiers: Solid-liquid systems, Compression, Slurry deliquoring, Expression.

The theoretical developments and subsequent experiments to verify equations concerning the expression process, defined as the separation of a liquid from a solid-liquid system by compression, are discussed. The expression method of deliquoring is widely used in both chemical process industries and in sewage sludge treatments. Its mechanisms consist of two steps of flow phenomena, which may be analysed first by filtration theory and second by consolidation theory. Expression operations are seen to be classified into three types: constant pressure; constant rate; and variable pressure-variable rate operations; according to the time-pressure and flow rate relations. Basic laws govern the flow of fluids through porous media, and conventional definitions of filtration and consolidation characteristics aid in developing basic consolidation equations, as well as new definitions of filtration ratio, consolidation ratio, and modified consolidation coefficient. Good agreement between theories and experiments by using compression-permeability cell data was demonstrated. (Prague-FIRL)
W75-10969

CHLORINE-CONTAINING ORGANIC CONSTITUENTS IN CHLORINATED EFFLUENTS,
Oak Ridge National Lab., Tenn.
R. L. Jolley.
Journal Water Pollution Control Federation, Vol 47, No 3, p 601-618, March, 1975. 3 fig, 7 tab, 29 ref.

Descriptors: *Waste water treatment, *Chlorine, Analytical techniques, Chromatography, Municipal wastes, Effluents, *Chlorination, Organic compounds, Sewage treatment.
Identifiers: Organic constituents.

An examination was made of the chlorine-containing compounds present in the chlorinated primary and secondary effluents from two domestic waste water treatment plants. A 36Cl tracer, high resolution chromatographic method was used in the examination. Conclusions reached as a result of the study as are follows: stable chlorine-containing organic constituents were present after effluents had been chlorinated to a 1 to 2 mg/liter chlorine residual; anion-exchange chromatographic elution positions were established for these constituents; the chlorination yield was about one percent for a typical chlorinated secondary effluent; the chlorination yield was approximately constant with respect to chlorine dosage, but increased with increasing reaction time; the chlorination yield was about equal for both primary and secondary effluents; the major portion of the available chlorine in the chlorination of effluent was consumed in oxidation reactions; and, essentially equivalent results were obtained regardless of whether the effluent was chlorinated with chlorine gas or with hypochlorite solution. (Orr-FIRL)
W75-10970

AERATION DEVICES: BASIC THEORY,
Cape Town Univ. (South Africa). Dept. of Water Resources and Public Health Engineering.
G. v. R. Marais.
Water Pollution Control, Vol 74, No 2, p 172-173, 1975.

Descriptors: *Waste water treatment, *Aeration, Equipment, Air entrainment, Bubbles, Aerobic conditions, Oxygen, Mixing, Dissolved oxygen, Oxidation.
Identifiers: Diffused-air bubble aerators, *Mechanical aerators.

Aeration in waste water treatment is the process by which oxygen is supplied to the liquor so that the organisms present are able to oxidize the organic content of the waste water. The three stages of transfer of oxygen from the gaseous to liquid phase are: transfer of the oxygen molecules from the air to the liquid interface; passage of the oxygen through a liquid film of about three molecules thick by molecular diffusion; and, dispersion of the oxygen into the body of liquid by further diffusion and convection. The two basic types of aeration devices, diffused-air bubble aerators and mechanical aerators, both utilize the first stage of oxygen transfer. The diffused-air principle introduces small air bubbles through diffusers; oxygen transfer from the interface to the body of liquid is governed principally by the process of molecular diffusion and therefore is greatly affected by surface impurities in the liquid. In mechanical aeration, the shearing action of the impellers creates new interfaces; mass transfer is governed by surface renewal and only slightly affected by diffusion transportation. Manufacturers of aeration equipment usually give a figure for the oxygen transfer rate, the mass of oxygen that the aeration device can introduce into a body of water per unit of time-per unit of power absorbed at the aerator shaft. Equations are presented which enable one to modify the manufacturer's figure for oxygen transfer rate to allow the non-standard conditions during operation. (Orr-FIRL)
W75-10971

ADJUDICATING TENDERS FOR AERATION DEVICES: BEST VALUE AND RELIABILITY,
J. Halliday.
Water Pollution Control, Vol 74, No 2, p 184-185, 1975.

Descriptors: *Aeration, Equipment, *Waste water treatment, Costs, Economics.
Identifiers: *Aeration devices.

In deciding which aeration device to choose one must consider more than just the capital cost. One method for doing this is to calculate the annual interest and redemption on the capital and add this to a calculated cost of power required. For a conventional aeration plant the annual power cost may equal the annual interest and redemption on the aeration equipment, while for an extended aeration plant the cost of power may be twice that of interest and redemption. The efficiencies of all the components of an aeration device must be examined in relation to their particular mode of operation. Efficiencies of all the components of an aeration device tend to decrease with reduced load. This reduction in efficiency must be considered where water levels vary considerably or if there is to be oxygen control by means of two-speed motors or varying the depth of aerator immersion. In terms of reliability attention should be given to the drive for the aerator, the gearboxes, bearing life, to methods which prevent the total loss of oil from the gearbox in the event of the failure of the oil seal, and which prevent moisture from getting in the gearbox. Ensuring reliability in the plant begins in the specifications. Reliability costs money and is dependent upon good basic mechanical design. The purchaser should set his minimum standards in the specifications and then perhaps place weight on the additional features which may be offered by various aeration devices. (Orr-FIRL)
W75-10972

SETTLEMENT AND SLUDGE RETURN IN ACTIVATED-SLUDGE TYPE PACKAGE PLANTS,
P. B. B. Vosloo.
Water Pollution Control, Vol 74, No 2, p 197-198, 1975. 2 ref.

Descriptors: *Activated sludge, *Waste water treatment, Aeration, Sludge, Dissolved oxygen, *Sludge treatment, *Treatment facilities.
Identifiers: Packaged plants, Sludge return.

The sludge in most activated sludge package plants occasionally tends to be light and bulky. This is frequently due to over aeration. To control this, the oxygen input should be arranged so that at peak flow the DO drops to below one mg/liter, while at low flows it rises to 3 or 4 mg/liter. Because of the tendency of package plants to produce a light, flocculent sludge, it is recommended that their sedimentation sections provide for a lower rise rate than that which is normally acceptable for larger plants. It is better to by-pass a portion of the incoming flow when a period of abnormally high flow coincides with a period of abnormally light sludge, rather than to pass everything through the plant and risk losing a large proportion of the activated sludge. Many packaged plants do not have mechanical means for returning sludge but rely instead on the slight difference in density between sludge in the lower portions of the settling zone and the mixed liquor in the aeration zone to make the sludge flow back into the aeration zone by gravity. This type of system has been found unsatisfactory. The best type of package plant has a pump for the return of the sludge. Sludge return ratios in excess of 1:1 are unnecessary unless the sluge level in the settling zone rises to near the overflow level in which case the the ratio may be increased to 1.5:1 or even 2:1. (Orr-FIRL)
W75-10973

UNDERGROUND WASTEWATER TREATMENT PLANTS,
Vattenbyggnadsbyran Ltd., Stockholm (Sweden). Water and Environmental Div.
E. Isgard.
Journal Water Pollution Control Federation, Vol 47, No 4, p 684-687, April, 1975. 1 fig, 1 tab, 4 ref.

Descriptors: *Waste water treatment, *Construction costs, Water reuse, Design criteria, Odor control, *Treatment facilities.
Identifiers: *Underground treatment plants, Ventilation, *Sweden.

The underground construction of water reclamation plants is an established technique in Sweden. Problems encountered in design and operation of underground plants are discussed. While underground facilities were originally designed for civil defense, the present advantages of undergrounding are saving of space in urban areas, ease in expansion of facilities, environmental control, and protection against adverse weather. Specific cost problems are related to construction in various types of rock. Design criteria must consider expandability; for example, at Kappala, a transport tunnel was built between the existing and future plants. Proper heating and ventilation are necessary, particularly ventilation of hydrogen sulfide from pre-aeration. Measures must be designed for odor control and to prevent inundation and explosions. Careful tightening of excavation is also required to prevent drainage of soil above the excavations and settling of streets or buildings. Such design difficulties have been overcome at many underground facilities in the Stockholm area, providing favorable treatment results. (Prague-FIRL)
W75-10974

INNOVATIVE PROCESS TREATS WASTEWATER,
D. A. O'Sullivan.
Chemical and Engineering News, Vol 53, No 18, p 27-28, May, 1975. 1 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Aeration, *Biological treatment, *Aerobic conditions, Equipment, Pilot plants, Treatment facilities.
Identifiers: Deep shaft process.

A deep shaft process for waste water treatment may be considered as the most significant advance in sewage technology in the past 60 years. The advantages of this technique over conventional water treatment methods include: low capital and operating costs; more economical use of land; absence of offensive odor; and, lower production of sludge. The process involves continuous circulation of waste water throughout a vertical shaft. Aerobic bacteria feed on the entrained organic matter. A stream of air injected into the shaft provides both the driving force to maintain circulation and the oxygen necessary for aerobic biological treatment. The unit is a cylindrical steel or concrete shaft, with a diameter between 0.4 and 10.0 m, which extends into the ground to a depth of 100-300 m. The dimensions depend on the volume of effluent to be treated. A unit 135 m deep is capable of efficiently accepting and transferring one kg of oxygen/hr/cu m of effluent. The process results in an overall land saving of about 50%. The large activated sludge ponds and anaerobic digestion units are eliminated. Oxygen uptake efficiency can be 90% or greater in the new system compared with the 10% level achieved in present-day sewage treatment works. A pilot unit has been running continuously treating whole raw sewage from the sewage works at Billingham, Great Britain. (Orr-FIRL)
W75-10975

ANAEROBIC ACIDOGENESIS OF WASTEWATER SLUDGE,
Institute of Gas Technology, Chicago, Ill.
S. Ghosh, J. R. Conrad, and D. L. Klass.
Journal Water Pollution Control Federation, Vol 47, No 1, p 30-45, January, 1975. 7 fig, 7 tab, 16 ref.

Descriptors: *Waste water treatment, *Methane, *Sewage treatment, Anaerobic conditions, *Anaerobic digestion, Anaerobic bacteria, Digestion, *Sludge treatment.
Identifiers: *Anaerobic acidogenesis.

The anaerobic digestion process is popular in the waste treatment field because of the following reasons: its capability of stabilizing large volumes of dilute organic slurries at low cost; its low biomass production; the high kill rate of pathogenic organisms; its capability of producing solid residue suitable for use as soil conditioners; and, its ability to convert the organic carbon in the feeds to a product gas stream high in methane that can be substituted for natural gas. This study was designed to determine the feasibility of maintaining dominant cultures of acidogenic organisms with waste water sludge feeds by kinetic control, compile information on the biokinetic characteristics of acidogenic organisms; and, to develop guidelines and criteria for operating acid-phase digestion with waste water sludge feeds. A general discussion on the theory and operating principles of the two-phase digestion process is presented with special emphasis on the acidogenic phase of the total process. Results of the study showed that stable, steady-state operation of the two-phase process is possible with waste water sludge for extended time period. The two-phase digestion process may be operated at one-half of the detention time of a high-rate digester and still exhibit higher rates of solids stabilization and methane production. The suggested reason for this high achievement is that phase operation allows the two groups of digester organisms to attain their full metabolic potential and thereby effect substantial improvement in overall digestion efficiency. (Orr-FIRL)
W75-10976

$3-MILLION AND TWO-AND-A-HALF YEARS TO SOLVE CAMPBELL RIVER'S SEWAGE PROBLEMS,
G. Beardsley.
Water and Pollution Control, Vol 113, No 4, p 57-59, April, 1975.

Descriptors: *Sewage treatment, *Waste water treatment, Storm runoff, Sewerage, Pipelines, Pumps, Interceptor sewers, Planning, *Canada, *Treatment facilities.
Identifiers: *Campbell River(BC).

The Campbell River District, British Columbia, has designed a secondary sewage treatment to fit the needs of its population of 11,000. The area had been subjected to intrusion of storm water into the sanitary system. A new collection system and treatment plant were planned and funded from various federal and provincial sources. The entire project was carried out between February 1972 and May 1974. A 14,000 foot long trunk pressure line was constructed so as to serve the area initially by gravity. An eighteen-inch diameter Sclairpipe was chosen for the pressure main. Four pumping stations were installed along the highway. Flygt pumps were used throughout the system. The installation of collector sewers was complicated by the problem of terrain, necessitating grading the trunks continuously because of the shoreline is very close and seepage from the sea was a danger. The plant was designed and screened so as to be aesthetically compatible with its residential surroundings. Public relations efforts were also made and the reaction to the new system was favorable. The plant capacity is currently enough to serve a population of 15,000, with anticipated modular additions for a population of 30,000. (Prague-FIRL)
W75-10977

ALGAE REMOVAL USING DISSOLVED AIR FLOTATION,
Ellsworth Engineering and Associates, Idaho Falls, Idaho.
W. F. R. Bare, N. B. Jones, and E. J. Middlebrooks.
Journal Water Pollution Control Federation, Vol 47, No 1, p 153-159, January, 1975. 18 fig, 3 tab, 26 ref.

Descriptors: *Waste water treatment, Algae, Suspended solids, *Flotation, Flocculation, Pilot plants, Laboratory tests.
Identifiers: *Algal removal, *Dissolved air flotation, Ferric sulfate, Alum.

The study described was conducted to evaluate the effectiveness and economic of dissolved air flotation as a method of removing algae from waste water stabilization pond effluents. The operating parameters studied included algae concentration, coagulant dosage, and percentage recycle. Some of the conclusions made, based on bench-scale and pilot plant tests, are as follows: direct pressurization did not provide good suspended solids removal in raw, naturally flocculated, or chemically flocculated algal samples; pressurized recycle greatly improved the removal efficiencies in naturally and chemically flocculated samples; 85 mg/liter of ferric sulfate were required to flocculate an algal suspension of about 100 mg/liter to obtain solids removal greater than 90% in the batch tests; 75 mg/liter of alum were required to flocculate an algal suspension of about 100 mg/liter to obtain solids removal greater than 90% in batch tests; 175 mg/liter of alum were needed to flocculate an algal suspension of about 125 mg/liter to obtain 90% solids removal in pilot plant tests; and, the difference in chemical requirements between pilot plant and bench-scale tests was thought to be caused by a higher concentration of algae in pilot plant tests, a major difference in the algal species being removed, and the dynamic nature of the pilot plant tests as compared with the static, ideal conditions of bench-scale tests. The total annual cost of operating air flotation system was estimated to range from $39,000/year for a one mgd plant to $457,300/year for a 20 mgd plant. (Orr-FIRL)
W75-10978

PHYSIOCHEMICAL TREATMENT OF WASTE-WATER-SEAWATER MIXTURE BY ELECTROLYSIS,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
C. P. C. Poon, and T. G. Brueckner.
Journal Water Pollution Control Federation, Vol 47, No 1, p 66-78, January, 1975. 6 fig, 4 tab, 23 ref.

Descriptors: *Waste water treatment, *Electrolysis, *Nutrient removal, *Sea water, Activated carbon, Anodes, Cathodes, Electrochemistry, Phosphorus, Nitrogen, Desalination.
Identifiers: *Physico-chemical treatment.

A study was performed to determine the feasibility of a simple and reliable waste water treatment system using electrolysis of waste water and seawater. The process is intended for the removal of BOD, phosphorus and nitrogen, and also for disinfection. The electrolysis cell employed contains graphite anodes on the bottom of the cell with an iron cathode placed above them. Seawater is used as the anolyte and waste water as the catholyte. The electrolytic cell, operated as a batch unit, was shown to be capable of producing an effluent of higher quality than a secondary effluent. Both phosphates and nitrogen may be effectively removed to meet the most stringent effluent standard. However, some nitrogen content is inevitable in the final effluent. Therefore, the batch electrolysis process can be considered extremely effective when control of phosphates is absolutely required, but control of nitrogen is less critical. Polishing of the effluent from batch electrolysis treatment with activated carbon adsorption produce an essentially pollutant-free discharge. The batch operation necessitates the use of small treatment units. A bank of electrolytic cells can be used to handle moderate to high waste water flows. This may be higher in terms of the capital cost, but will add to the flexibility of the plant in terms of operation and expansion plans. The treatment requires no specialized operator training, uses no chemicals, produces a relatively small quantity of sludge, and is unaffected by low temperatures. (Orr-FIRL)
W75-10979

DESIRABLE PROVISION IN CURRENT DESIGNS FOR FUTURE DEVELOPMENT IN RELATION TO RECLAMATION OF EFFLUENT,
National Inst. for Water Research, Pretoria (South Africa).
J. L. Barnard.
Water Pollution Control, Vol 74, No 2, p 177-180, 1975. 3 fig, 4 ref.

Descriptors: *Waste water treatment, *Nutrient removal, *Design, Biological treatment, Denitrification, Sewage treatment, Aeration, Dissolved oxygen, Activated sludge, Nutrient removal.
Identifiers: Phosphorus removal, Nitrogen removal.

Modifications to the activated sludge process for the removal of nitrogen and phosphorus necessitate changes in the design and application of aeration equipment. The removal of phosphates from sewage by precipitation without chemical addition has been observed in plug-flow plants. In this case, fine bubble aeration in the last compartment and a minimum DO content of 3-4 mg/liter mixed liquor are recommended. When ferrous sulfate is used to precipitate phosphates (200 mg/liter ferrous sulfate), the oxygen requirements increase to 7.5 oxygen/liter of feed. The modification of the activated sludge process for the total removal of nitrogen involves recycling of nitrate-rich mixed liquor to a compartment at the head of the aeration basin. The first and third basins are not aerated but stirred to keep the solids in suspension. The DO in the second basin should be kept between one and 2 mg/liter. Therefore, the aerators in this basin should be of such a size and so located in the basin that they can be switched in or out according to the oxygen requirements. Whether to use surface aerators or bubble aerators depends upon several factors. Surface aerators are generally more economical than bubble aerators when only oxygen transfer efficiency is considered. The cooling effect of the various aerators needs to be considered when nitrification and denitrification are desired since reaction rates decline with decreasing temperatures. Automatic control of DO is recommended since this results in a power cost savings that can offset in two years the cost of the equipment for DO control. (Orr-FIRL)
W75-10980

ICI'S DEEP SHAFT 'HALVES SLUDGE VOLUME',
B. Appleton.
New Civil Engineer, April, 1975. 3 fig.

Descriptors: *Waste water treatment, *Sewage treatment, Biological treatment, Equipment, Industrial wastes, Sludge, Treatment facilities.
Identifiers: *Deep shaft process, Sludge production volume.

ICI's Agricultural Division has developed a new treatment process for raw sewage of industrial effluent. The effluent circulates around a 150 m deep shaft and emerges requiring only final settlement and sludge dewatering. The claims for the deep shaft process include: only 50% of the sludge volume generated by a conventional works; low capital cost; low operating cost; a highly efficient oxygen transfer system makes the process ideal for roughing treatment of high strength liquors; and, absence of odor. The process relies on a colony of bacteria in the circulating liquor to purify the effluent. The effluent circulates vertically in the shaft, completing about 20 circuits in the 2 hour retention time. The air used for biological oxidation also provides the driving force for liquid circulation. The process involves: feeding incoming sewage into a vertical carbon steel tube extending to the bottom of the shaft; recycled sludge from the subsequent sludge-separation stage is added to maintain the bacteria colony; air is injected into the inner tube to provide the necessary oxygen; spent air is vented to the atmosphere at the head of the shaft; and, a conventional overflow weir outlet carries the purified effluent to the sludge separation stage. Deep narrow shafts are preferred for weak liquors requiring high quality treatment, while roughing treatment of high strength industrial waste is most economically provided in shallower broader shafts. One hundred and fifty meters has been chosen as the optimum depth for domestic sewage treatment, the shaft diameter being fixed by the design retention time of 2 hours. (Orr-FIRL)
W75-10981

MEMBRANE DESALTING GETS BIG PUSH,
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 3A.
W75-10982

WATER POLLUTION PROBLEMS IN SALISBURY, RHODESIA: PRESENT AND FUTURE,
For primary bibliographic entry see Field 5G.
W75-10983

NITROGEN REMOVAL IN A PILOT PLANT,
Vattenbyggnadsbyran Ltd., Stockholm (Sweden).
B. Ericsson.
Journal Water Pollution Control Federation, Vol 47, No 4, p 727-740, April, 1975. 9 fig, 2 tab, 18 ref.

Descriptors: *Nitrification, *Denitrification, *Waste water treatment, Pilot plants, Filters, Tanks, Sludge, Costs, Nitrogen, Nutrient removal, Phosphorus.
Identifiers: Phosphorus removal, Sweden.

Nitrogen removal is used as an alternative to phosphorus removal in limiting algal growth. While the method chosen depends on the type of water and dissolved nitrogen compounds, concentrations, and associated costs, the most promising method in Sweden is biological nitrification-denitrification. Results from a pilot plant operation demonstrated that biological nitrification in a tank system is best accomplished by a double sludge system for combined and separate carbon degradation and nitrification. Critical rate of nitrification at 95% yield was found to be about 3.0 and 2.2 NH3-N/hr/g vss at 18 C and 12 C, respectively. The BOD:NH3-N ratio after pre-sedimentation influences the oxygen requirement, the sludge yield and the acid produced; pH is also very important. The rate of denitrification in the anaerobic filter with plastic media at about 95% yield during the first period at 18 C was about 9 g NO3(-)-N/hr, with a 1.8 hour detention time. The choice between a tank reactor and an anaerobic filter for denitrification depends upon costs and upon operational safety. While the anaerobic filter proved to be safer during the operational trial, it was more expensive. It was recommended that further experimentation be conducted to improve the sludge settleability in the tank reactor system and the system be compared with flotation. (Prague-FIRL)
W75-10984

INDUSTRY AND COMMUNITY IN COOPERATION,
K-Konsult, Lund (Sweden).
L. Nilsson.
Journal Water Pollution Control Federation, Vol 47, No 4, p 760-763, April, 1975. 4 fig.

Descriptors: *Waste water treatment, Municipal wastes, Biochemical oxygen demand, Biological treatment, Alum, Economics, *Treatment facilities, Industrial wastes.
Identifiers: Sweden, *Combined treatment.

A successful combined municipal/industrial waste water treatment facility is described. The plant was designed for the township of Kagerod, Sweden and a milk products industry. The township's population, under 2000, produces about 270 lb of biochemical oxygen demand per day. Industrial waste water is expected to average 1000 lb BOD per day, corresponding to 7500 person equivalents. Average daily flow for the new treatment plant will accomodate 4950 cu ft/hr, 1030 cu ft/hr of this from the milkfood plant. The facility uses biological treatment with the activated sludge method and chemical post precipitation treatment with alum. Sludge is dried with industrial smoke and a Nateko dryer. Operation results since 1972 have been very efficient; water emitted from the plant showed a remainder of 22 mg BOD/gal, 27 mg nitrogen/gal, and 0.9 mg phosphorus/gal, or a reduction of 99, 89, and 99%, respectively. The dryer is successful in sulfur reduction as well. The dryer makes it possible to use heating oils with a high sulfur content and still emit less sulfur, thus decreasing costs of heating oil The results of this system are a economical advantage for both industry and the municipality and a cleaner living environment. (Prague-FIRL)
W75-10985

WASTEWATER TREATMENT PLANT ODORS: A CONTINUING ENIGMA,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
R. D. Neufeld.
Public Works, Vol 106, No 3, p 83-84, 106, 107, March, 1975. 1 tab, 22 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Odors, *Municipal wastes, Treatment facilities, Absorption, Adsorption, Organic compounds, Pollution abatement, Pennsylvania.
Identifiers: Allegheny County(Penn).

One major problem in the operation of both domestic and industrial waste water treatment plants is the control of odors. The Allegheny County Sanitary Authority (ALCOSAN) has built a treatment network for coping with this problem. Because of the complexity of odorants from various sources, six general classifications of techniques for abatement of odorous air have been defined. These are: combustion; adsorption; absorption; vapor mixing; source reduction; and dilution. Source reduction is a difficult defense against odors, and dilution of odors by discharge through tall stacks into the atmosphere is an alternative which has been discouraged. Combustion for complete destruction of organics requires high temperatures for a sufficient time period. Adsorption with activated carbon requires a system design which accounts for the variety of potential odorants, and determines the offending chemical which is most poorly retained on the carbon. Absorption or scrubbing is suitable only when odorous vapors are soluble, reactive, or emulsifiable in water. Also, organic compounds which comprise most of the odor producing substances in waste are insoluble without the addition of oxidants. Vapor mixing with odor masking or odor modification is controversial as it is not always successful and it does not reduce the atmospheric burden of organic gases but rather increases it. ALCOSAN is presently most concerned with fecal odor from sewage sludge process; gases from filters will be ducted into existing incinerators, other control will require chemical oxidation. (Prague-FIRL)
W75-10986

WATER CONSERVATION IN SWEDEN: III. CURRENT TRENDS,
Ministry of Agriculture, Stockholm (Sweden).
For primary bibliographic entry see Field 5G.
W75-10987

CARBON REGENERATION BY WET AIR OXIDATION,
Zimpro, Inc., Rothschild, Wis.
W. B. Gitchel, J. A. Meidl, and W. Burant, Jr.
Chemical Engineering Progress, Vol 71, No 5, p 90-91, May, 1975. 1 fig, 1 tab, 12 ref.

Descriptors: *Waste water treatment, *Activated carbon, Adsorption, Tertiary treatment, Laboratory tests, Sewage treatment, Physical properties, Water quality, *Oxidation.
Identifiers: *Wet air oxidation, Carbon regeneration.

The results of physical and chemical tests and full-scale plant tests on the water quality produced by wet air oxidation regenerated activated carbon are summarized. The quality of the water produced by the regenerated carbon was found to be equal to the best obtained by using virgin carbon. Results indicate that wet air oxidation causes some reduction of surface in pores under 10 angstroms radius while increasing surface in all other pores. Absorption isotherms show that most Cl-C4 compounds are not adsorbed even by virgin carbon with a full compliment of surface in the smallest pores. These small carbon compounds are readily removed by biological treatment, suggesting therefore that the surface in 10 angstrom or smaller pores is not essential in waste water treatment. The chemical and physical tests show that wet air oxidation does restore all the adsorbate relative efficiencies (R.E.) and pore structure of the parent carbon to a very high degree with the exception of the mentioned small pores. It is concluded that spent carbons may be fully regenerated by wet air oxidation in terms of the application of these carbons. (Orr-FIRL)
W75-10988

LAMELLA SEDIMENTATION: A COMPACT SEPARATION TECHNIQUE,
Axel Johnson Institutet for Industriforskning, Nynashamn (Sweden). Engineering Dept.
B. Forsell, and B. Hedstroem.
Journal Water Pollution Control Federation, Vol 47, No 4, p 834-842, April, 1975. 12 fig, 3 ref.

Descriptors: *Waste water treatment, Sedimentation, *Settling basins, *Separation techniques, Equipment, Sludge treatment.
Identifiers: *Lamella separators, *Lamella sedimentation.

Lamella sedimentation has the advantages of reducing the demand for large building areas and/or volumes and also of low operating and overall costs. Modern lamella sedimentation techniques have profited from advances in fluid dynamics research and materials technology. A general description of lamella sedimentation is given with reference to the topics of surface effectiveness and compactness, sludge density, sludge volume and resistance to shear forces, flow variations, fluid mechanics, special problems of lamella sedimentation, and the mechanical construction and layout of a lamella sedimentation plant. The area that is theoretically available for separation in a lamella apparatus is equal to the sum of the projections on the horizontal plane of the separation plates. In a continuously working separator, a large enough inclination angle must be chosen so that the sludge separating on the plates may be continuously and efficiently removed. Flow pattern can be either cocurrent or counter current; the choice depends on the fraction of the sludge volume which is light, network forming, low yield stress and which is heavy, finely dispersed, high yield stress. A lamella sedimentation plant consists of a particular number of separating plates working in parallel, large plants may contain several thousand. Smaller plants, less than 250 sq m, may be designed as package plants. In larger plants, the lamella device is usually one step in a process line in which all units are contained in a common concrete building block. (Orr-FIRL)
W75-10989

LIQUID CO2 PROTECTS OUR WATER'S QUALITY,
Kansas City Water Dept., Mo.
For primary bibliographic entry see Field 5F.
W75-10990

VIRUS REMOVAL AND INACTIVATION DURING WATER TREATMENT,
Maine Univ., Orono. Dept. of Civil Engineering.
O. J. Sproul.
Journal of the New England Water Works Association, Vol 89, No 1, p 6-15, March 1975. 5 tab, 12 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Viruses, Coagulation, Sedimentation, Filtration, Disinfection, Chlorine, Ozone, Recreation, Environmental effects.
Identifiers: *Viral removal, Virus inactivation.

The increased use of water for recreational purposes has made it necessary to decrease the viruses in water after treatment. Coagulation and sedimentation, rapid sand filtration and disinfection in a series are used by a complete water treatment plant. Removal of poliovirus can be as high as 99.9% when magnesium is precipitated from the water. Coagulation has also resulted in a high virus removal rate. Filtration through sand can remove viruses completely from treated waste water effluent provided the distance is long enough. Chlorine used properly is an effective viricide. Ozone is also an effective disinfectant. In the future research and development to minimize effects on the environment from viruses through treatment plants would be useful. Standards for treating potable and waste water should also be developed. (Dean-FIRL)
W75-10991

ACTIVATED CARBON IN THE WATER TREATMENT PLANT,
Massachusetts Dept. of Public Health, Lawrence. Lawrence Experiment Station.
A. E. Sylvia.
Journal of the New England Water Works Association, Vol 98, No 1, p 29-35, March 1975.

Descriptors: *Activated carbon, *Treatment facilities, *Waste water treatment, *Water quality standards, Public health, Legislation, Industrial wastes, Surface runoff, Odor, Taste, Potable water, Microorganisms, *Pollutant identification.
Identifiers: Carbon chloroform extract, Rapid Fluorescence Technique.

Coal is the source of granular activated carbon commonly used by water treatment plants. Public health officials are concerned not only by the odor and taste problems but also by the chemicals from industrial plant effluents and natural surface runoff entering the public water supply. Activated carbon beds and columns will adsorb the chemicals most concerning the public health officials as potential health hazards. The Environmental Protection Agency has been trying to pass a bill that would extend their authority beyond bacteriological quality of water supplies to include physical, chemical, and biological standards. Passage of this legislation would mean that a number of water districts would have to use additional treatment to meet the standards. Carbon Chloroform Extract (C.C.E.) is high on the EPA list. Work is being continued on the development of a rapid fluorescence technique. The method has undergone extensive testing and seems to be valid for measurement of microorganisms in potable water when compared to the CCE method. (Dean-FIRL)
W75-10992

HIGH COSTS MODIFY SEWAGE PLANT EXPANSION.
Engineering News-Record, Vol 194, No 15, p 81-82, April 10, 1975. 3 fig.

Descriptors: *Waste water treatment, *Construction costs, *Treatment facilities, Flow rates, Costs, Potomac River, Biochemical oxygen demand, Nitrogen, Phosphorus compounds, Estuaries, Cyanophyta, Fishkill, Sludge disposal, Tertiary treatment.
Identifiers: Washington, DC, Blue Plains Sewage Treatment Plant(DC).

Rising construction and energy costs have forced a slowdown in the plans to expand and upgrade by installing an advanced waste treatment system that would remove nitrogen and phosphorus at Washington, D.C.'s Blue Plains sewage treatment plant. The present facility is a modified activated sludge plant handling an average flow of 250 mgd with a peak of 300 mgd with a secondary treatment process removing 70% BOD and suspended solids. The upgraded plant would handle 309 mgd with a peak of 650 mgd and the new modified aeration plant will remove 95.5% BOD, 98% phosphorus and nitrogen and 90% ammonia. Because of Blue Plains' proximity to the Potomac tidal estuary, the removal of both nitrogen and phosphate was believed necessary to end growth of blue-green algae which has on occasion matted and caused fishkills. If phosphorus removal could slow the growth, construction costs would be lower. Sludge disposal presents another problem. Incineration of the sludge according to present plans would require 50 million kwh of electricity and 13.7 million gallons of fuel oil in 1978. Presently the sludge is being disposed of by burying and surface land disposal. Another solution is selling composted sludge for fertilizer providing the odor problem can be overcome. (Dean-FIRL)
W75-10993

MINITEST METHOD FOR MONITORING EFFLUENT QUALITY,
Uppsala Univ. (Sweden). Algal Assay Lab.
E. Elfving, A. Forsberg, and C. Forsberg.

Journal Water Pollution Control Federation, Vol 47, No 4, p 720-726, April 1975. 3 fig, 2 tab, 18 ref.

Descriptors: *Waste water treatment, Data collections, Chemical oxygen demand, Water quality, Effluents, Nitrification, Biological treatment, Activated sludge, Analytical techniques, Treatment facilities, *Pollutant identification.

The long-run efficiency of six different treatment plants is described with the use of data obtained by continuous sampling from July 1973 to July 1974. Data include the effects of treatment disturbing factors, such as technical errors, incoming oil, or toxic compounds. Processes demonstrated are biological treatment with activated sludge, and biological treatment in combination with five different types of phosphorus removal systems. Information was given on PO4-P, total P, NH4-N, NO2-N, NO3-N, AGP, and COD. The analysis of effluents from chemical treatment plants showed that both presimultaneous and postprecipitation gave, at maximum phosphorus reduction, weekly average values of about 0.2 mg/liter. The treatment efficiency was reduced by disturbances and by technical errors. The nitrification processes showed a comparatively high correlation with temperature. Some negative AGP values were found. Average COD values were between 30 and 40 mg/liter. (Prague-FIRL)
W75-10994

OIL SPILL TECHNOLOGY,
Environmental Protection Service, Ottawa (Ontario). Environmental Emergency Branch.
For primary bibliographic entry see Field 5G.
W75-11001

PUMP SELECTION,
Associated Engineering Services Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 8C.
W75-11002

CALCIUM SULFATE SOLUBILITY IN BRACKISH WATER CONCENTRATES AND APPLICATIONS TO REVERSE OSMOSIS PROCESSES: POLYPHOSPHATE ADDITIVES,
Oak Ridge National Lab., Tenn.
L. B. Yeatts, P. M. Lantz, and W. L. Marshall.
Desalination, Vol 15, No 2, p 177-192, 1974. 7 fig, 2 tab, 12 ref.

Descriptors: *Desalination, Reverse osmosis, Water reuse, Potable water, Filtration, Chemical precipitation, Desalination plants, *Waste water treatment.
Identifiers: *Calcium sulphate, Hyperfiltration, Polyphosphate additives.

Most naturally occurring brackish waters contain substances that may foul reverse osmosis membranes, such as magnesium, calcium, and sulfate ions, and small amounts of hydroxide ion. The extent to which saline water can be concentrated with hyperfiltration or by the reverse osmosis process to recover pure water is dependent upon the saturation precipitation of these substances. The solubility at 25C of CaSO4 . 2H2O (gypsum) was investigated for three brackish waters at reverse osmosis plants in Gillette, Wyoming, and Webster, South Dakota, and from the Wellton-Mohawk post-irrigation canal in Arizona. It was found that sodium hexametaphosphate, when added in small amounts, produces an apparent increase in the saturation concentration of CaSO4. Calculations for maximum water recoveries and relationships to the reverse osmosis process were discussed. (Prague-FIRL)
W75-11004

MILESTONE WATER LEGISLATION ACCOMPANIED BY MILLSTONE OF BUREAUCRATIC RED TAPE,
Hampton Roads Sanitary District, Norfolk, Va.
For primary bibliographic entry see Field 5G.
W75-11007

HOW TO ESTIMATE AND ESCALATE COSTS OF WASTEWATER EQUIPMENT,
ICARUS Corp., Silver Spring, Md.
H. G. Blecker, H. S. Epstein, and T. M. Nichols.
Chemical Engineering, Vol 81, No 22, p 115-121, October, 1974. 13 fig, 2 tab.

Descriptors: *Waste water treatment, *Costs, *Equipment, Computer programs, Engineering, Design, Installation, Water works, Alternative costs, Capital costs, Construction costs, Installation costs, Initial costs, Real costs, *Treatment facilities.

Charts and tables of cost data are presented to aid in the preparation of conceptual or rough estimates of the cost of facilities for treating waste water, or comparing alternative processing schemes. A technique for escalating the estimate to a future time is also described. The cost data were generated as a computer-aided design and estimating system which determines equipment costs in the same way as an equipment vendor and assembles the complete installed costs the same way a contractor does at the definitive stage. Graphs are included giving the purchased-equipment costs (or field-erected cost), equipment-setting manhours, installed-equipment cost, total field-labor manhours, and the labor-to-material ratio. An example of how to determine the escalation of cost is given. To determine the total installed cost for the equipment item in a South Philadelphia treatment plant in the 2nd quarter 1976, the estimated purchased-equipment cost for the 2nd quarter 1975, the material cost (less equipment) for 2nd quarter 1975 and the field-labor cost for 2nd quarter 1976 must all be calculated. The graphs cover such equipment as storage vessels, vertical pressure vessels, field labor for vertical pressure vessels, general-service centrifugal pumps, reinforced concrete aeration basins, motor-driven reciprocating pumps, motor-driven rotary blowers, variable speed motors and rectangular excavations. (Orr-FIRL)
W75-11014

HOW SILICA AFFECTS IRON REMOVAL FROM GROUNDWATER,
Yule, Jordan and Associates, Camp Hill, Pa. Environmental Engineering Div.
For primary bibliographic entry see Field 5F.
W75-11016

YWA PLAN FOR CLEANER RIVERS,
B. Appleton.
New Civil Engineer, p 21-22, January 23, 1975.

Descriptors: *Water pollution control, Rivers, *Waste water treatment, Water pollution sources, *Storm runoff, *Sewage treatment, Sewerage, *Overflow, Planning, Industrial wastes.
Identifiers: Yorkshire River Authority(Gt Brit).

The Yorkshire Water Authority, Great Britain, has developed plans for water pollution control of its two major rivers. Sources of pollution are both industrial and municipal. One problem is overflow from sewers during storms. Where the capacity of a sewer has been reduced to below twice dry weather flow, serious surcharging occurs during storms, causing pressure buildup so that manhole covers are blown off and sewage flows out of these openings. Infiltration from surrounding groundwater adds to normal surface runoff and thus further reduces the amount of foul sewage retained in the sewer. When the Rother river level rises, discharges from sewage overflows is shut off and sewage flows into the river as the storm abates and river flow drops. Plans include building of new interceptor sewers to pick up sewage from existing and new branch sewers and to carry up to 50 cu m/sec to a low level pumping station. Another development is a trunk sewer to relieve parts of the city. Besides sewerage problems, the area rivers are polluted from mine drainage. Treatment requires aeration for complete oxidation followed by settlement of the ochre. Other plans include an investigation of the possibility of mixing industrial effluents with domestic sewage for treatment at the local sewage plant. (Prague-FIRL)
W75-11017

COST SHARING TO HELP CLEAN OUR WATERWAYS.
For primary bibliographic entry see Field 5G.
W75-11023

NITROGEN REMOVAL IN THE OPERATION OF THE MILILANI SEWAGE TREATMENT PLANT,
Hawaii Univ., Honolulu. Water Resources Research Center.
G. L. Dugan, R. H. F. Young, and R. T. Tsutsui.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 718, $3.75 in paper copy, $2.25 in microfiche. Technical Memorandum No 44, September 1974. 20 p, 5 fig, 6 tab, 7 ref. OWRT A-047-HI(1). 14-31-0001-4011.

Descriptors: Nitrogen, *Activated sludge, *Anaerobic digestion, *Sewage treatment, Effluents, Eutrophication, Sludge treatment, Sedimentation, *Waste water treatment, Nutrient removal, *Hawaii, Settling basins, Aeration.
Identifiers: *Rapid Bloc process, *Nitrogen removal rates.

The effluent of the Mililani Sewage Treatment Plant (STP), Oahu, Hawaii, from January 1972 to January 1973 contained only approximately 30% of the total nitrogen that was originally in its raw sewage. During the period that high nitrogen removal rates were observed, raw sewage flowed directly to the 'Rapid Bloc' activated sludge unit. Sludge stabilization was by aerobic digestion. During the fall of 1973, a primary sedimentation tank and an anaerobic digester (which replaced the aerobic digester) were added to the components of the STP. A study was initiated for a one-year period, 1 July 1973 to 30 June 1974, in an attempt to determine the mechanism for nitrogen removal for both before (Phase I) and after (Phase II) modifications to the STP. The waste water flow during Phase I, July to August 1973, averaged 0.65 mgd with an overall total nitrogen removal of about 54%. The major nitrogen loss in the effluent speculated to be by means of gaseous ammonia to the atmosphere, apparently occurred in the aeration unit, settling tank, and aerobic digester. During Phase II studies, January through June 1974, the mean monthly flow increased by approximately 30% and the mean total nitrogen loss decreased to 29%, a range that is typical for conventional secondary activated sludge operations. In both Phases I and II, ammonia nitrogen was the predominant form showing major losses.
W75-11041

PROCESS FOR TREATING SEWAGE SLUDGE,
American Cyanamid Co., Stamford, Conn. (assignee)
H. P. Panzer, and K. W. Dixon.
U.S. Patent No 3,894,948, 7 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1008, July 15, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Sludge treatment, Dewatering, Chemical reactions, Polymers, Waste disposal.
Identifiers: *Chemical treatment.

In the disposal of sludge formed in processing of sewage, it is beneficial to concentrate or thicken the sludges as much as possible to facilitate disposal. A method of treatment is provided which comprises adding to the sludge an effective

amount of a water-dispersible polyquaternary polymer consisting essentially of the reaction product of a lower dialkylamine, a polyfunctional amine, and a difunctional epoxy compound selected from the group consisting of epihalohydrins, diepoxides, precursors of epihalohydrins and diepoxides which under alkaline conditions are readily converted into the corresponding epoxy compounds and mixtures thereof. (Sinha-OEIS)
W75-11064

PROCESS FOR TREATING INDUSTRIAL WASTES,
American Cyanamid Co., Stamford, Conn. (assignee)
H. P. Panzer, and K. W. Dixon.
U.S. Patent No 3,894,946, 8 p, 8 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1007-1008, July 15, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, Water quality control, *Flocculation, Chemical reactions, *Polymers.
Identifiers: *Chemical treatment.

A process of flocculating industrial wastes is described in which the wastes are treated with an effective amount of a polyquaternary polymer obtained from reaction of a major portion of secondary amine, a minor portion of polyfunctional amine and an epoxy type reactant whereby the polyquaternary polymer obtained has a solution viscosity at 25 C of at least 100 centistokes as a 37%, by weight, aqueous solution, based on the cationic portion of the polyquaternary compounds. (See also W75-11067) (Sinha-OEIS)
W75-11066

PROCESS FOR TREATING INDUSTRIAL WASTES,
American Cyanamid Co., Stamford, Conn. (assignee)
H. P. Panzer, and K. W. Dixon.
U.S. Patent No 3,894,947, 5 p, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1008, July 15, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, Water quality control, *Flocculation, Chemical reactions, Polymers.
Identifiers: *Chemical treatment.

Flocculatable industrial wastes are treated with effective amounts of polyquaternary polymers obtained by reaction of a difunctional epoxy type reactant with a secondary amine to a solution viscosity above a minimum value. This process has a widely diversified range of utility. The high efficiency of the process not only enables greater solids removal to be effected but allows desirable removal to be achieved at lower flocculant usages than is conventionally required. (See also W75-11066) (Sinha-OEIS)
W75-11067

ELECTROLYTIC SEA WATER PROCESS,
Diamond Shamrock Corp., Cleveland, Ohio. (assignee)
For primary bibliographic entry see Field 3A.
W75-11068

AEROBIC LAGOON WASTE TREATMENT SYSTEM AND METHOD,
Kimberly-Clark Corp., Neenah, Wis. (assignee)
A. R. Le Compte, Jr., and D. W. Appel.
U.S. Patent No 3,893,924, 5 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 660, July 8, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water quality control, Water pollution treatment, *Aerobic treatment, Aeration, Water circulation, Lagoons, *Sewage lagoons, Aerated lagoons, Jets.

A highly efficient system and method for effectively treating liquids containing waste materials are disclosed. By the selection and placement of specific types of aerators it is possible to operate an aerobic lagoon at a fraction of the power requirements heretofore thought necessary. The system includes the use of jets placed within the liquid and directed so as to form primary circulation cells having an average velocity of at least about 0.3 foot per second and secondary circulation within the cells sufficient to substantially prevent solids which have been subjected to primary separation from settling out. The flow within the cell is designed to be complementary to adjacent cells and create a serpentine path from inflow to outlfow of the lagoon. A quiescent zone may be provided within the lagoon for sludge settling, or a separate polishing pond may be utilized. (Sinha-OEIS)
W75-11069

MOBILE UNIT FOR TREATING LIQUID WASTE,
Chemfix, Inc., Pittsburgh, Pa. (assignee)
D. J. Opacic, A. L. Lengyel, E. A. Zawadzki, and F. H. Jackson.
U.S. Patent No. 3,893,656, 4 p, 13 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 576, July 8, 1975.

Descriptors: *Patents, *Waste water treatment, Industrial waste, *Waste disposal, Water pollution control, Water quality control, Equipment, Liquid wastes.
Identifiers: Setting agents, Mobile equipment.

A mobile unit for treating liquid waste to render it non-polluting and fit for ultimate disposal includes a mixing hopper having an inlet for receiving liquid waste, and an outlet for connection to a conduit extending to the disposal area. The unit also includes a bin for a powdered setting agent for a liquid alkali metal silicate. The bin has an outlet at its bottom and a porous floor spaced above its bottom. Compressed air is delivered to the space beneath the floor to form a fluidized bed of setting agent above the floor. The setting agent is delivered to the mixing hopper in which it is mixed with the liquid waste. After the mixture leaves the hopper, liquid alkali metal silicate from a tank in the mobile unit is delivered to the mixture. The treated waste will set after it has reached the disposal area. (Sinha-OEIS)
W75-11073

LOW TEMPERATURE WATER PURIFICATION SYSTEM,
Pollution Control, Inc., South Barre, Vt. (assignee)
For primary bibliographic entry see Field 5F.
W75-11074

WASTEWATER TREATMENT PLANT,
Autotrol Corp., Milwaukee, Wis. (assignee)
W. N. Torpey.
U.S. Patent No. 3,894,953, 5 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1010-1011, July 15, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Organic wastes, Water pollution control, *Septic tanks, Separation techniques, Anaerobic digestion, Biological treatment, Hydrogen sulfide, *Treatment facilities.

A modified septic tank with troughs arranged to be fed in parallel controls the detention time of wastewater passing through the troughs to the range of from 2 to 4 hours thereby minimizing the addition of gasses to the effluent wastewater, particularly hydrogen sulphide that is evolved in the lower portion of the tank in connection with the digestion of settled organic solids. The substantial reduction in hydrogen sulphide in the effluent wastewater from the septic tank makes available a maximum amount of surface for the growth and maintenance of organisms oxidizing carbonaceous and/or nitrogenous pollutants on the downstream rotating contactors. A biological treatment unit such as those employing rotating contactors can be provided to treat the effluent from the septic tank. (Sinha-OEIS)
W75-11076

FLOCCULATION DEVICE FOR WASTE FLUID TREATMENT,
Wheelabrator-Frye Inc., New York. (assignee)
C. K. Walther, K. Beckschafer, and K. E. Temme.
U.S. Patent No. 3,893,921, 3 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 659, July 8, 1975.

Descriptors: *Patents, *Waste water treatment, *Water purification, Water pollution treatment, *Coagulation, *Flocculation, Equipment.
Identifiers: Vibration.

An apparatus for coagulating and flocculating waste fluid includes a tank attached to a vibrating treatment device from which the waste fluid is discharged. A variable rate pump or other means injects a flocculating agent into the tank, where it is effectively mixed with the waste fluid due to the vibration of the treatment device. The waste fluid containing the flocculated material in suspension is then discharged from the tank for subsequent separation, as by filtration, centrifuge or the like. The apparatus employs a siphon-like arrangement to obtain greater efficiency under a continuous flow mode of operation. (Sinha-OEIS)
W75-11077

TOTAL WASTE RECYCLE SYSTEM FOR WATER PURIFICATION PLANT USING ALUM AS PRIMARY COAGULANT,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
L. K. Wang, and J. Y. Yang.
Resource Recovery and Conservation, Vol 1, No 1, p 67-84, May 1975; 4 fig, 10 tab, 34 ref. WA85-188, WA86-361.

Descriptors: *Waste water treatment, *Water treatment, Water quality, *Sludge treatment, *Recycling, *Coagulation.
Identifiers: Acid treatment, Alkaline treatment, Alum sludge, Zero waste discharge, Resource recovery, *Waste recycling, Filter backwash water, Alum recycle.

A systems study to investigate the feasibility of total recycle of wastes generated from water purification plants has been conducted. Wastewater and alum sludge used in were collected from a water plant employing water treatment processes including aeration, chemical addition, mixing, flocculation and sedimentation followed by filtration, pH adjustment, fluoridation and chlorination. Wastewater and sludge are generated mainly from the sedimentation basin and the filter backwash. The waste recycle system studied consisted of (a) treating the filter backwash water in a sludge separator, (b) dividing the combined sludge into two fractions for alum solubilization respectively in an acid treatment unit and an alkaline treatment unit, (c) screening the inert silt for ultimate disposal, and (d) returning the solubilize alum from the acid and alkaline treatment units in proper proportions for reuse as flocculation agent. The proposed recycle process was designed to provide a cost effective system for achieving 'zero' waste discharge from a water purification plant. Inasmuch as the inert silt collected during water treatment is derived from raw water supply an elimination of added chemical discharges may

be regarded as satisfying the desired 'zero' discharge objectives. Although detailed process design parameters necessary to achieve the above stated goal have not been established, experimental results tend to suggest that practical designs based on the proposed recycle system are feasible. W75-11094

THE EFFECTS OF FREE AMMONIA AND FREE NITROUS ACID ON THE NITRIFICATION PROCESS,
Cornell Univ., Ithaca, N.Y.
A. C. Anthonisen.
Available from University Microfilms, Inc., Ann Arbor, Mich, 48106. Order No 74-24,253. PhD Thesis, 1974, 323 p.

Descriptors: *Ammonia, *Nitrification, Municipal wastes, *Waste water treatment, Nitrites, Nitrates, Pilot plants, Microorganisms, Bacteria, Acids, Denitrification, Inhibition.
Identifiers: Un-iodized ammonia, Un-iodized nitrite, Nitrobacter, Nitrosomonas, *Nitrous acid.

Research has been conducted on the accumulations of nitrite as observed in soil, natural waters and waste treatment systems which receive industrial, agricultural, and municipal wastes. The hypothesis postulated was that un-ionized ammonia (FA) and unionized nitrite (FNA) are inhibitory to nitrifying organisms and their effects cause nitrites to accumulate and persist. Both laboratory and pilot plant tests were completed to investigate the reaction rates for the organisms Nitrosomonas and Nitrobacter. Results indicated that FA inhibition to Nitrobacter occurred at concentrations much lower than those required to inhibit Nitrosomonas. Nitrites thus accumulated without subsequent oxidation to nitrate. In liquid waste systems, accumulation of nitrite was shown to be directly related to concentrations of FA and FNA and independent of pH, ammonia and nitrite concentrations. FA inhibits Nitrosomonas nitrification at 10.0 to 150.0 mg/liter; FA inhibits Nitrobacter at 0.1 to 1.0 mg/liter; and FNA inhibits Nitrosomonas and Nitrobacter nitrification at 0.22 to 2.6 mg/liter concentration. It appears possible to control the nitrification patterns that occur during the oxidation of ammonia using operational procedures that consider the inhibitory effects of FA and FNA. (Prague-FIRL)
W75-11101

MEASURES OF BIODEGRADABILITY AND REFRACTORY ORGANICS IN WASTEWATERS: (ANALYSIS, INTERPRETATION, AND APPLICATION OF MEASUREMENT TECHNIQUES),
Connecticut Univ., Storrs.
F. L. Hart.
Available from University Microfilms, Inc., Ann Arbor, Mich, 48106. Order No 75-10,627. PhD Thesis, 1975, 125 p.

Descriptors: *Measurement, *Oxidation, *Hydrogen, Carbon, Nitrification, *Biodegradation, *Analytical techniques, Municipal wastes, Industrial wastes, *Waste water treatment, *Pollutant identification, *Refractivity.
Identifiers: Refractory Index(RI), Ultimate Oxygen Demand(UOD).

The Ultimate Oxygen Demand (UOD) method for evaluating the total amount of oxidizable material bearing hydrogen, oxygen, carbon, and nitrogen, in waters was developed. A working parameter was formulated to approach the derived evaluation based on output responses of available analyzers. A modified Warburg Respirometer is used to determine the biodegradable portions of the total materials present, with a correction term for nitrification inconsistencies. The ratio of degradable material to the total oxidizable material is the Refractory Index (RI). The formula is RI = BOD(ultimate)/UOD. According to this index, easily degradable materials such as domestic raw sewage or glucose have RI values of 0.97 and 0.93, indicating 93-97% degradation, while industrial dye wastes or benzene have RI values of 0.56 and 0.23. Specific organic compounds were classified in terms of bio-persistence, using the RI values. Other uses of these values are suggested, such as the evaluation of acceptability of industrial waste discharge to municipal biological treatment facilities or the use as a preliminary treatment parameter. (Prague-FIRL)
W75-11103

WATER TREATMENT BY OZONE, (IN JAPANESE),
K. Oda.
Seikatsu Eisei, (J. of Urban Living and Health Assoc), Vol 18, No 6, p 168, 1974. 13 fig, 20 ref.

Descriptors: *Waste water treatment, *Reviews, *Water treatment, *Ozone, Oxidation, Detergents, Organic compounds, Color, Odors.
Identifiers: Reaction time, Decolorization, Deodorization.

The use of ozone for water treatment is reviewed. The greatest advantage of ozone usage is that it does not give any reaction residue. Ozone is one of the strogest oxidizing agents, therefore it decomposes most compounds in a relatively short reaction time. Ozone can be used for decolorization, deodorization, sterilization, and decomposition of organic compounds as well as of inorganic compounds such as cyanides. The sterilization effect of ozone is 15 to 30 times stronger than that of chloride gas or hypochlorous acid. Most decomposition of unsaturated organic compounds by ozone is believed to proceed by ozonolysis followed by aldehyde formation and stable organic acid formation. Ozone is also useful in treating synthetic detergents such as alkyl benzene sulfonate for which biological treatment is very difficult. If ozone alone is used to treat water, a large amount of ozone consumption is needed and the process is less economical. Therefore, ozone treatment is recommended for use with other water treatment methods such as activated carbon and floatation techniques. (Katayama-FIRL)
W75-11107

ACTIVATED CARBON ADSORPTION TECHNIQUE FOR THIRD STAGE SEWAGE WATER TREATMENT, (IN JAPANESE),
T. Kasakura.
Kankyo Sozo, (Environment Creation), Vol 5, No 1, p 72, January, 1975. 10 fig, 3 tab, 7 ref.

Descriptors: *Waste water treatment, *Activated carbon, *Sewage treatment, Tertiary treatment, Pilot plants, Filtration, Precipitation(Chemical), Adsorption, Turbidity, Phosphorous.
Identifiers: Aluminum sulfate, Adsorption towers.

A pilot plant to test the activated carbon adsorption technique for the third stage treatment of sewage water was constructed and operates at Nagoya city. The third stage water treatment plant consists of precipitation, filtration, and adsorption processes. After second stage treatment by an activated sludge method, sewage water is mixed with aluminum sulfate to precipitate most of the phosphorous compounds. The precipitates are filtered out at the rate of 350 m/d before entering an adsorption tower filled with 320 kg of activated carbon, with average particle sized of 0.90 mm. An average 72% of the total phosphorous in the second stage water was removed by the precipitation treatment, and 99% was further removed by the activated carbon treatment. The turbidity of the second stage water was improved an average 79% and 97% by aluminum sulfate precipitation and activated carbon treatments, respectively. The COD values in the precipitation and adsorption processes were 19.5 ppm and 1.8 ppm, respectively, and the corresponding TOD values were 38.9 ppm and 18.8 ppm. Several adsorption towers were installed in parallel and sewage water flowed through at the rate of 300 m/d. The life of activated carbon was between 800 to 1200 hr dependent on temperature which affected the efficiency of activated sludge treatment. The regeneration of deactivated carbon was seen to be achieved by heating at 800 C for 90 min. (Katayama-FIRL)
W75-11108

ON-SITE HYPOCHLORITE GENERATION,
Salford Univ. (England).
A. Kuhn.
Processing, Vol 21, No 3, p 6-7, 1975. 4 fig.

Descriptors: *Waste water treatment, *Sodium compounds, *Sewage treatment, *Municipal wastes, Electrolysis, Chemical industry, Industrial wastes, Equipment, Oxidation, Odors, Chemical oxygen demand.
Identifiers: On-site generation, Sodium hypochlorite, Great Britain, *Hypochlorite cells.

It has been shown that on-site generated sodium hypochlorite has several uses. The application for which this process has the greatest potential is in the treatment of municipal sewage. A sucessful demonstration of the process at Guernsey, Great Britain, involved pure seawater electrolysis followed by its passage to a separate stirred reactor tank where it was contacted with sewage. In the United States, Several installations using on-site hypochlorite generation are in operation. In Clark County, Nevada, only the supernatant liquid from the primary digester, rather than a full effluent stream, was electrolytically treated. Liquor was passed through the acutal electrolysis cell using electrodes of Pb02; benefits were attributed to direct oxidation of dissolved or suspended matter at the electrode surface. Vigorous evolution of gases achieved flotational effect. The froth that formed carried with it a high proportion of solids, leaving the liquor lower in COD. Modern commercially available hypochlorite cells are described; all were of the florce-flow, narrow gap design. The treatment processes detailed are also useful in oxidizing and disinfecting within the chemical industry, in heat exchanger fouling control, in deodorizing for tobacco plants, and in sterilizing of food processing equipment. (Prague-FIRL)
W75-11109

OPTIMUM VALUES FOR OPERATIONAL VARIABLES IN TURBIDITY REMOVAL,
Mosul Univ. (Iraq).
M. A. Al-Layla, and E. J. Middlebrooks.
Water and Sewage Works, Vol 121, No 8, p 66-69, August, 1974. 9 fig, 3 tab, 8 ref.

Descriptors: *Flocculation, *Water treatment, *Turbidity, *Alum, *Mathematical models, Operations, Treatment facilities, *Waste water treatment.
Identifiers: Alum dosage, *Turbidity removal.

A study was designed to define the effect of the main variables that can influence the efficiency of present flocculation basins in water treatment plants, thereby contributing to improving the design of flocculation basins. Variables were paddle speed, time, and alum dosage. The other objectives were to determine the interactions between time of flocculation and alum dosage, flocculation time and paddle speed, and paddle speed and alum dosage, flocculation time, and paddle speed. Methods included analysis of variance, linear, logarithmic, and multivariable mathematical models. It was concluded that the most significant idenpendent variable was paddle speed followed by flocculation time and alum dosage; dosage was 25 mg/liter for the study conditions; optimum paddle speed ranged between 40 and 50 rpm; and optimum flocculation time was about 30 minutes. Certain equipment and methods were shown to be important in removal of turbidity from water treatment plants. These were variable speed flocculator paddles, multiple flocculation basins that can be used in series or parallel operation, and the use of

jar tests to determine the optimum alum dosage continuously during the operation of water treatment plants. (Prague-FIRL)
W75-11110

A SOLUTION TO PUMP STOPPAGES,
Irvine Ranch Water District, Calif.
For primary bibliographic entry see Field 8C.
W75-11111

A PLANNING OF CATCHMENT SEWERAGE FOR OYODO RIVER (IN JAPANESE),
M. Ishiguro, and Y. Watanabe.
Miyazaki Daigaku Kogakuru Kenkyu Hokoku, (Research Report of Miyazaki Univ., Dept. of Engineering), No. 20, p 35-45, August 1974. 5 fig, 12 tab, 20 ref.

Descriptors: *Sewerage, *Planning, *Waste water treatment, *Water quality control, Construction costs, Rivers, Water pollution, Treatment facilities, Biochemical oxygen demand, Waste treatment, Activated sludge.
Identifiers: *Oyodo River(Japan), Catchments.

A plan of catchment sewerage for protecting water quality of the Oyodo River in Japan is discussed. Present and future water quality were analyzed according to observed data. The river catchment area was divided into three blocks and the water pollution loads in each block were estimated. Within each area, construction-maintenance costs and treatment efficiencies of various sewer transport-treatment systems were compared. It was concluded that construction of high degree treatment plants with an activated sludge process for 95% BOD removal should be implemented in all three blocks. However, a treatment plant of 95% BOD removal is very difficult using present techniques. Thus, it was advised to use other treatment processes simultaneously. These included irrigation treatment, oxidation ponding, lagooning, and a rotating biological contactor process, in addition to a plant of 88% BOD removal with an activated sludge process. (Prague-FIRL)
W75-11113

ADVANCED WASTEWATER TREATMENT (IN JAPANESE),
M. Shimodo, and Y. Okada.
Onoda Kenkyu Hokoku, (Research Reports of Onodo Cement Co.), No. 26, p 92-98, 1974. 11 fig, 9 ref.

Descriptors: *Waste water treatment, *Tertiary treatment, Nitrogen, Phosphorus, Lime, Precipitation(Chemical), Calcium carbonate, Calcium hydroxide, Inorganic compounds.

Advanced waste water treatment technology is utilized to remove pollutants which are not adequately removed by conventional secondary treatment processes. Such pollutants include soluble inorganic compounds (phosphorus, nitrogen) which may support algal growth in receiving water. Lime precipitation is the most useful technology for removal of phosphorus compounds from waste water. The chemical reactions of lime precipitation involve the condensed phosphate being readily hydrolyzed in the presence of Ca2+ and OH-. Calcium hydroxide then reacts with orthophosphate to precipitate calcium hydroxyapatite. As pH increases above 10.0, the precipitation of calcium hydroxyapatite increases, so that phosphate removal is improved with increasing pH. Also, calcium-hydroxide reacts with the bicarbonate alkalinity of waste water to form calcium carbonate and calcium hydroxide is regenerated. (Prague-FIRL)
W75-11114

HUNTINGDON RESEARCH CENTRE PASVEER OXIDATION PLANT--SIX YEARS ON,
Huntingdon Research Centre (England). Dept. of Building and Maintenance.
B. J. Spring, and E. R. E. Briscoe.
Public Health Engineer, Vol 14, p 35-39, March 1975. 4 tab.

Descriptors: *Waste water treatment, *Design criteria, *Activated sludge, *Oxygenation, Biochemical oxygen demand, Oxygen requirements, Oxidation lagoons, *Treatment facilities.
Identifiers: Oxidation channels.

The operation of the waste water treatment plant (Pasveer Oxidation Plant) at the Huntingdon Research Centre is described for the years following its installment in 1966. The capacity of the system to absorb heavy temporary overloading was established but the increased loading and greater sludge production increased the time required to clear the draw-off system and also increased the time required to draw-off the total volume, thus reducing the time available for oxygenation. The reduction of oxygenation time made additional oxidation capacity necessary. To meet the oxygen input requirement, a Flygt Pump, type CG 3605, was installed in May, 1971. In October, 1972, a new oxidation channel began operation. Several charts are included which show the average daily flow based on a 7-day week, the average daily flow based on a 5-day week, and the peak daily flow for every month in the years 1967 through 1973. The results of studies performed throughout 1968-1971 are presented in chart form. These include: BOD loading in terms of kg/d and percent of design limit; BOD in the raw waste, channel discharge, and final effluent; suspended solids in the raw waste, channel discharge, and BOD reduction overall in the channel discharge and final effluent. It is apparent from the records of the plant that there is no 'typical day' and that the volumes and characteristics of the waste vary considerably and do not follow any consistent pattern. The plant has had no odor problem of any kind and a recreational area is being planned for its surrounding land. (Orr-FIRL)
W75-11115

INVESTIGATIONS ON THE LONG TERM BIOCHEMICAL OXIDATION OF SEWAGE,
T. Stones.
Water Pollution Control, Vol 74, No 2, p 231-233, 1975. 2 fig, 1 tab, 16 ref.

Descriptors: *Sewage treatment, *Waste water treatment, *Biochemical oxygen demand, *Biodegradation, Nitrification, Nitrogen compounds, Organic compounds, *Oxidation.
Identifiers: *Biochemical oxidation.

The biochemical oxidation of sewage occurs in two broadly distinct stages, the first of which is attributed to the oxidation of the carbonaceous compounds present in the sewage, and the second to the oxidation of the nitrogenous matter present. However, the dichromate value of sewage which closely approximates the total carbonaceous oxygen demand greatly exceeds the first-stage BOD thus indicating that only part of the carbonaceous material is oxidized in the first step. Experiments performed determined that the remainder is inert to biochemical oxidation and is not oxidized along with the nitrogenous matter during the second stage. It was found that a second stage of biochemical oxidation of sewage is due to the fact that an induction period of about eighteen days (for the proliferation of the nitrifying organisms initially present) is necessary before nitrification can begin. This lag period is coincidental with the time required for the carbonaceous oxidation rather than caused by an inhibiting effect of carbonaceous matter on the nitrifying organisms as had been previously thought to be the reason for the lag time. (Orr-FIRL)
W75-11116

TREATMENT METHODS OF GROUNDWATER CONTAINING A LARGE QUANTITY OF HUMIC ACID (AUFBEREITUNGSVERSUCHE AN EINEM STARK HUMINSTOFF-BELASTETEN TIEFENGRUNDWASSER),
T. Harpe, and D. Eichelsdoerfer.
Vom Wasser, Vol 42, p 207-220, 1974. 7 fig, 3 tab, 10 ref.

Descriptors: *Humic acids, *Groundwater, *Waste water treatment, Water treatment, Organic compounds, *Filtration, Pilot plants, Aeration.
Identifiers: *Germany(Hamburg-Curslack).

Treatment of water containing humic acids must consider special problems. Humic acids were identified in order to study their reactivity under different treatment methods. Experiments on deep groundwater with a high content of humic acids from Hamburg-Curslack, Germany, are reported. Colloidal brown humic acids were identified. The colloidal form was highly unstable against air oxygen. Thus, experiments were conducted to eliminate the organic matter by filtration on a pilot plant scale. In a closed system, raw water was filtered after aeration, using different filter materials. Without additional flocculants, humic acids can be removed to 3% of their original content. (Prague-FIRL)
W75-11117

OXIDATION OF ORGANIC COMPOUNDS IN WATER (OXIDATION ORGANISCHER VERBINDUNGEN IN WASSER),
C. Bannert, and P. Speiser.
Vom Wasser, Vol 42, p 221-239, 1974. 3 fig, 12 tab, 14 ref.

Descriptors: *Oxidation, *Waste treatment, *Organic compounds, *Waste water treatment, Gas chromatography, Pollutant identification.
Identifiers: *Hydrogen peroxide.

The oxidative treatment of polluted water containing organic impurities is becoming increasingly important. The oxidative degradation of all organic material to carbon dioxide was studied by treating pure organic compounds (serving as models for common impurities) with hydrogen peroxide. The organic compounds were treated in aqueous solution for 15 minutes at 150, 225, and 300C with hydrogen peroxide in the presence of catalysts. The optimum oxidation was found to occur in a 3 to 5 pH range and at 225C. Temperature increases to 300C as well as greater than stoichiometric additions of hydrogen peroxide were found to achieve no better oxidation effects. The concentration of the organic pollutants had no influence on the oxidation effect in the range investigated. The organic residuals were measured by gas chromatography as total organic carbon. (Orr-FIRL)
W75-11118

NITROGENOUS CHANGES DURING THE SETTLEMENT OF SEWAGE,
T. Stones.
Water Pollution Control, Vol 74, No 2, p 234-235, 1975. 1 tab, 3 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Nitrogen, Organic compounds, Ammonia, Settling basins, Treatment facilities.
Identifiers: Organic nitrogen.

It is known that there is a reduction in organic nitrogen during settlement of sewage. Two theories to account for this phenomena are that the reduction is due to biological activity, independent of settlement, or that reduction is due to conversion of part of the organic nitrogen to ammonia. In a test, the amounts of ammoniacal and organic nitrogen present were determined for samples of sterilized and unsterilized sewage, both when fresh and when 18 hours old. On the average, organic nitrogen was reduced by 48.8% during settlement for 18 hours. However, 32.5% of this was independent of settlement, implying that only 16.3% was actually due to deposition. An increase of

25.0% in the amount of ammoniacal nitrogen present was clearly due to the decomposition of nitrogenous organic matter. The resulting reduction in the total amount of nitrogen effected by settlement was only about 8%. As there was no change in nitrogenous constituents of sterilized samples, the effects of biological activity are confirmed. In routine analysis of sewage in a facility, samples are 24 hour composites compounded hourly from individual samples, with varying degrees of conversion of organic nitrogen to ammonia having occurred. Thus, although an increase in ammonia concentration is noted in sewage settlement, exact changes taking place in nitrogenous constituents of sewage during passage through sedimentation tanks is not usually measured. (Prague-FIRL)
W75-11120

AERATION DEVICES: THE MANUFACTURER'S VIEWPOINT,
I. R. M. Greig.
Water Pollution Control, Vol 74, No 2, p 191-192, 1975. 2 ref.

Descriptors: Equipment, *Aeration, *Waste water treatment, *Sewage treatment, Sludge, Design criteria, Tanks, Construction costs, Sludge disposal, Economics, Treatment facilities, Africa.
Identifiers: *South Africa, Extended aeration, Aeration tanks.

Technical specifications for sewage treatment systems utilizing aeration are discussed, in particular those used in South Africa. The current practice used is extended aeration. The system involves only one basic process line with long retention in the aeration tanks, and limited experience is necessary for operation of facilities. Also, extended aeration offers economic advantages over conventional plants in construction costs. Problems with extended aeration include sludge development with poor settling characteristics due to denitrification and a predominance of filamentous organisms. Also, the sludges produced by this process are voluminous, and difficult to consolidate and dry. Since 1966, however, aeration has been the predominant process for activated sludge treatment. Facilities are being designed for nitrification and biological denitrification within the same plant. The relationship between equipment and tank design is critical because different aerators have bery different operational characteristics. Oxygenation efficiency of an aerator is directly related to volume of the aeration tank. Depth is the most important criterion and most manufacturers prefer shallow (up to 3 m) tanks to eliminate the use of baffles, bottom mixing turbines, or draught tubes. It was concluded that aeration tank design should be decided by the mechanical equipment supplier in order that the most suitable geometry be chosen for a particular aerator design. (Prague-FIRL)
W75-11121

SIMPLIFIED WASTE WATER PURIFICATION THROUGH PHYSICAL-CHEMICAL TREATMENT (VEREINFACHTE ABWASSERREINIGUNG DURCH PHYSIKALISCH CHEMISCHE BEHANDLUNG),
K. R. Dietrich.
Wasserwirtschaft, Vol 65, No 5, p 125-129, May 1975. 1 fig, 4 ref.

Descriptors: *Waste water treatment, *Sewage treatment, Flotation, Flocculation, Adsorption, Drainage, Chemical precipitation.
Identifiers: *Physico-chemical treatment.

Physico-chemical treatment of sewage is described as characterized by flocculation, precipitation, absorption, and flotation. Chemicals are applied successively and have a high reaction capacity with colloids by opposite charging. They also have a high adsorptive capacity for the oxygen depleting dissolved organic matter found in sewage. Flotation is a result of oxidation with air in the presence of chemicals acting as catalysts. The subsequent result is an improvement of drainage ability of silicate sludge. (Nave-FIRL)
W75-11122

CHEMICAL-BIOLOGICAL TREATMENT WITH BIOLOGICAL FILTERS,
Salisbury City Engineer's Dept. (Rhodesia).
A. B. Neeley.
Water Pollution Control, Vol 74, No 2, p 160-165, 1975. 2 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Lime, Pilot plants, Capital costs, Filters, Phosphates, Denitrification, Operation, Sludge treatment, Treatment facilities, Africa.
Identifiers: Phosphate removal, Recarbonation, *Rhodesia.

Pilot scale experiments with lime addition at the primary stage of a conventional works is discussed. The objective of the study was to find a process which could initially be used on a seasonal basis, requires little capital expenditure, and can be used with existing treatment facilities. A pilot facility was tested at Salisbury, Rhodesia, after laboratory study. Lime precipitation with recarbonation enabled the filter to work well. Costs for lime storage, dosing, and pH control were low; major capital expenditure would be necessary only if denitrification, suspended solids removal and sludge recalcining were needed. It was concluded that conventional biological filter plants could be converted for phosphate removal at low cost, without excessive revenue expenditure. Under certain circumstances, it might be economic to use lime to reduce overload on a works rather than to extend it. If phosphate removal was needed on an overloaded works, the process would be very economical. Effluents from this system would be well suited to treatment by denitrification. Because necessary installation would not interfere with normal operation, the system is applicable for seasonal use in conjunction with a farm. (Prague-FIRL)
W75-11123

AERATION BY MEANS OF BLAST NOZZLE--A POSSIBILITY FOR THE AERATION OF BIOLOGICAL WASTE WATER TREATMENT PLANTS (DIE STRAHLDUESENBEGASUNG--EINE MOEGLICHKEIT ZUR BELUEFTUNG BIOLOGISCHER KLAERANLAGEN),
H-H. Daucher, P. Kroetzsch, K. H. Popp, and R. Stickel.
VDI-Berichte, No 218, p 239-249, 1974.

Descriptors: *Waste water treatment, *Aerators, *Activated sludge, Oxygen, Municipal wastes, Industrial wastes, Aeration, Equipment, Biological treatment, Treatment facilities.

A blast nozzle aerator and its use for the aeration of activated sludge in biological waste water treatment plants is described. Blast nozzles are placed horizontally near the bottom of the aeration tank. These blow air, oxygen-enriched air, or oxygen into the water, while performing a rotary motion due to the tangential arrangement of the nozzles. The rotary motion provides for necessary circulation of the water. At an immersion depth of 1.6 m, the oxygen input ranges from 1.5 to 2.5 kg of dissolved oxygen per kWh, while nozzles with 4 m immersion reach oxygen inputs over 4 kg/kWh. The blast nozzles are equally suitable for the aeration of municipal and industrial waste water. (Takacs-FIRL)
W75-11124

LIMITATIONS OF USING A SIMULATION MODEL OF THE SOIL UNDER IRRIGATED CULTIVATION TO SIMULATE THE FUNCTIONING OF THE SOIL AS A PURIFYING SYSTEM (LIMITES D'UTILISATION D'UN MODELE DE COMPORTEMENT DU SOL SOUS CULTURE IRRIGUEE POUR SIMULER LE FONCTIONNMENT DU SOL COMME SYSTEME EPURATEUR),
Institut National de la Recherche Agronomique, Versailles (France). Soils Lab.
For primary bibliographic entry see Field 5B.
W75-11125

THE USE OF SOIL AS A PURIFYING SYSTEM (L'UTILISATION DU SOL COMME SYSTEME EPURATEUR),
Institut National de la Recherche Agronomique, Dijon (France). Laboratoire de Microbiologie des Sols.
G. Catroux, J-C. Germon, and P. Graffin.
Annales Agronomiques, Vol 25, No 2/3, p 179-193, 1974. 1 fig, 3 tab, 36 ref.

Descriptors: *Waste treatment, *Soil, *Organic matter, *Purification, Aeration, Waste disposal, Filtration, Soil mechanics.
Identifiers: Soil mechanics.

Filtration, retention and transmission of water, and aeration and retention of dissolved matter are discussed. The different functions of the soil system in purification are given, stressing the action of microflora and exportation by plants. Means of control in purification by soil are analyzed. Data are compared concerning the purification of waste water by soil and agronomic data on the evolution of organic matter. It was concluded that soil should be capable of purifying about 1,200 kg DCO per hectare per day. Details of the practical uses of soil as a purification system and the disposal of waste water are mentioned. (Prague-FIRL)
W75-11126

THE ECONOMY OF VARIOUS METHODS FOR DEWATERING SLUDGE FROM BIOLOGICAL PURIFICATION (UEBER DIE WIRTSCHAFTLICHKEIT VERSCHIEDENER VERFAHREN ZUR ENTWAESSERUNG VON BIOLOGISCHEM KLAERSCHLAMM),
Uhde (Friedrich) G.m.b.H., Dortmund (West Germany).
J. Lohmann.
Chemie-Ingenieur-Technik, Vol 46, No 20, p 852-856, 1974. 9 fig, 2 ref.

Descriptors: *Sludge treatment, *Dewatering, *Operating costs, *Capital costs, Centrifugation, Filters, *Waste water treatment, Filtration, Biological treatment.
Identifiers: Vacuum filters, Band press.

Sludge from biological purification can be dewatered in several steps and by equipment with varying costs and operating properties. On the basis of experimental results, capital costs, and operating costs, the influence of flocculant consumption on the dewatering costs is examined for the vacuum filter, the band press, and the centrifuge. If costs for the various dewatering apparatuses are calculated to include subsequent incineration, they will depend upon whether organic or inorganic flocculants or filtering agents are used for conditioning. For example, if use of an organic flocculant in a centrifuge is followed by a fluidized bed furnace, the costs for the mechanical dewatering stage increase, due to rising flocculant consumption. The decrease of the incineration costs slows down with increasing flocculant consumption. A low cost minimum is obtained at a specific flocculant consumption of 2.9 g/kg dry substance. For the vacuum filter and the filter press no cost minimums exist. The lowest costs are obtained when the minimum filtering agent is required to remove the cake from the filter cloth or the filter press is added. (Nave-FIRL)
W75-11127

DESIGN CONSIDERATIONS--WATER AND EFFLUENT DISPOSAL,
W. E. Brand.
Institute of Food Science and Technology, Vol 7, No 2, p 130-137, June 1974.

Descriptors: *Effluents, *Sewers, *Water pollution, *Sludge disposal, Industrial wastes, Rivers, Water quality, Management, Waste water treatment, Activated sludge, Domestic sewage.
Identifiers: Sewerage Bill of 1968(Scotland).

A Sewerage Bill was introduced into Parliament in 1968, with Part II of the bill concerning trade effluent in accordance with the recommendations of the Hill Watson Committee. According to this act, the local authority is compelled to 'provide public sewers to effectively drain their area domestic sewage, surface water and trade effluent and also provide sewage treatment works to effectively deal with the contents of the sewers'. The local authority has jurisdiction over conditions relating to the sewers into which trade effluent may be discharged; the nature and composition of all trade effluent, maximum quantity and hourly rate, the prohibition of any constituent of any trade effluent which may be detrimental to the operation of the sewers, and the provision of inspection chambers. In regard to water quality control, bacteriological quality, suspended matter, organic matter, dissolved gases and dissolved solids are the salient headings. Effluent standards are dependent upon the place of the trade effluent discharge. Standards applied to effluents being discharged into rivers are much more strict than the normal limit of less than 20 ppm BOD and 30 ppm suspended solids. More stringent pH and temperature limits are also enforced. Regulations of discharge to tidal waters would be less strict than discharge to a river. (Leibowitz-FIRL)
W75-11128

DRUG RESISTANT COLIFORMS CALL FOR RE-EVALUATION OF WATER QUALITY STANDARDS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5B.
W75-11130

WATER QUALITY CONTROL IN SEWAGE WATER TREATMENT, (IN JAPANESE),
E. Fujimoto, N. Sato, and T. Sekine.
Meiden Jiho (Meiden Riview), Vol 5, No 118, p 40-48, 1974.

Descriptors: *Water pollution control, *Waste water treatment, *Sewage treatment, Aeration, Instrumentation, *Model studies, Equations, Biochemical oxygen demand, Water quality control.

To control the operation of sewage treatment plants, mathematical equations are proposed for individual treatment units, such as the sand-precipitation pond, aeration tank, sterilization pond, sludge concentration bath, and sludge feedback system. The model equations reflect the water qualities at each individual unit as well as quantitative conditions appearing at each unit. The equations are to be used by computers to predict better quality, rather than quantity, control in sewage plants. For example, the equation to control air amounts supplied to aeration tanks is expressed as the function of amount of sewage water, oxygen mobility (which is a function of temperature), oxygen dissolution efficiency, BOD value, MLSS value in aeration tank, and aeration tank capacity. Therefore, to regulate the air amount in the aeration tanks, the measurements of amount of BOD, MLSS values, and dissolved oxygen are all necessary. The use of model equations for computer quality control will be applicable to sewage plants with future developments in sensoring instrumentation. (Katayama-FIRL)
W75-11133

TENSIDS (SYNDETS) AND THE WATER POLLUTION PROBLEM, (GESUND-HEITLICHE ASPEKTE DES TENSID-GEBRAUCHS),
Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Bodenund Lafthygiene.
I. J. Janicke.
Fortschritte der Medizin, Vol 93, No 8, p 377-378, March, 1975. 4 ref.

Descriptors: *Waste water treatment, *Surfactants, *Detergents, Domestic wastes, Sewage treatment, Toxicity, Legislation, Foreign research, Environmental effects, Biological treatment, Anaerobic digestion, Water pollution control.
Identifiers: Tensids(Syndets), Germany.

Surface active agents in sewage originating mostly from household detergents are an important factor in the determination of environmental influences on man, with special reference to the water supply. The current German legislation on detergents considers the problems in a comprehensive sense including the overall toxicity via and in the water system. The recent literature on toxicological values for warm-blooded animals and aquatic organisms such as sewage degrading bacteria and the influence of chemical structure is discussed. The toxicity of surfactants to a biological sewage treatment system including the effects on anaerobic digestion is considered to be of special importance. Successful control of environmental pollution caused by surfactants in the water can be achieved by the use of adequate sewage treatment. (Orr-FIRL)
W75-11134

INTERACTIONS OF HEAVY METALS IN THE ACTIVATED SLUDGE PROCESS,
Illinois Inst. of Tech., Chicago.
M. H. Cheng.
Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106, Order No 74-16992. PhD Thesis, 1973, 221 p.

Descriptors: *Activated sludge, *Heavy metals, *Waste water treatment, *Toxicity, Biological treatment, Sludge, Waste treatment, *Chemical reactions, Ions.
Identifiers: Freundlich equation, Langmuir Isotherm, Metal ions.

Although many reports on the toxic effects of heavy metals on biological wastes treatment processes have appeared in the literature, little is known about the physical-chemical interactions within the process between the sludge mass and dissolved metal ions. The kinetics of heavy metals uptake by activated sludge, the ability of the sludge to concentrate metal ions from waste water and the affinity of the sludge mass for metal ions were investigated. Metal uptake by the sludge was dependent upon such factors as pH and the concentrations of sludge, soluble supernatant organics, and metal ions present in the system. Binding capacity appeared to increase with increasing pH, and higher initial concentration of either metal ions or MLSS also augmented the uptake efficiency. If the proper conditions are present the sludge can concentrate heavy metals up to 2 percent or more (by weight) of the sludge mass, even at low initial soluble metal levels. Good correlation was found between the metal uptake by activated sludge and the expression of Freundlich or Langmuir Isotherm. At high initial metal concentrations, the metal ions precipitate and are entrapped within the biological floc of the activated sludge system. At lower metal concentrations, the metals are taken up by the biomass through other mechanisms, such as physical adsorption, complexation and diffusion. (Orr-FIRL)
W75-11173

TREATMENT PLANT MONITORING PROGRAMS: A PRELIMINARY ANALYSIS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
P. M. Berthouex, and W. G. Hunter.
Journal Water Pollution Control Federation, Vol 47, No 8, p 2143-2156, August 1975. 9 fig, 3 tab, 13 equ, 11 ref.

Descriptors: *Monitoring, *Water pollution control, *Waste water treatment, Costs, Treatment facilities, Decision making, Operations research, Sampling, Standards, Effluents, Behavior, Probability, Data collections, Optimization, Economics, Equations, Statistical models, Systems analysis, Design, Protection.
Identifiers: Control theory, Control charts, Sensitivity, Autocorrelation, Cost minimization.

Statistical monitoring should be used more extensively in pollution control. Monitoring is a prerequisite for control; it is needed to discover how much control is required or how effective applied controls have been. The design of an effective monitoring system requires balancing the protection purchased against the cost. An approach to this problem is outlined using a simple control chart to determine protection afforded. A simple system behavior/cost model is developed that includes a penalty for polluting as the incentive to purchase protection. Specifically, a compromise between daily treatment plant monitoring and no monitoring is explored. The economic sensitivity of the simple cost function derived from basic control theory is examined to ascertain how much sampling gives a good balance between effluent monitoring cost and assurance of being in compliance with an effluent standard. The statistics used indicate a near optimal sampling interval of 3 or 4 days; this gives a reasonable compromise which provides protection but will not overburden a small operation financially. This analysis provides a framework that small plants (where often the cost-benefit relationship is unclear) and regulatory agencies may use to consider rationally the motivation for and implementation of enforcement programs. (Bell-Cornell)
W75-11176

DISTRIBUTION-SYSTEM OPERATION ANALYSIS MODEL,
Omaha Metropolitan Utilities District, Nebr. Services Dept.
J. L. Gerlt, and G. F. Haddix.
Journal of the American Water Works Association, Vol 67, No 7, p 381-384, July 1975. 5 fig, 2 ref.

Descriptors: *Water distribution(Applied), *Operations, *Management, Projects, Constraints, Equations, Optimization, Simulation analysis, Computer programs, *Water treatment, Operating costs, Pumping, Storage, Pressure, Water demand, Networks, Energy, Mathematical models, Systems analysis, Model studies, *Distribution systems, *Nebraska.
Identifiers: *Omaha(Neb), *Systems operational analysis model, *Mixed integer programming, Hardy Cross method, Cost minimization, MAGEN computer language, Power, Electrical costs, Nodes.

In 1970, Omaha, Nebraska recognized the need for more efficient methods to operate and expand its water treatment and distribution system. As part of a comprehensive master plan, a systems operational analysis model (SOAM) of the district's treatment, pumping, and storage facilities was developed. This article presents a highly descriptive account of the model and its procedural application to the Omaha system. SOAM, designed to be used in conjunction with an advanced computerized Hardy Cross-type flow simulation model, employs mixed-integer optimization techniques and is utilized to derive least-cost combined treatment plant, pump-station, and storage-operation strategies. A simplified network for the Omaha municipal water system (MUD) is developed that is suited to analysis using the Hardy Cross program. Considered in detail are the defining equations and constraints for the system. Described are the network nodes, problem parameters, solution

variables, system defining equations, energy and power equations, cost equations, and other constaints. The minimization problem is solved using a three-module process: (1) an equation-constraint generation program using the MAGEN matrix generation language solves the (2) minimization problem for several water-use-demand profiles, and (3) a well-designed, easily read report of the second module is derived. It is concluded that the district's operating policies are nearly optimal for the current distribution system. (Bell-Cornell)
W75-11180

SIMULATION OF WATER QUALITY MANAGEMENT POLICIES,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 5G.
W75-11181

BARK AS TRICKLING-FILTER DEWATERING MEDIUM FOR PULP AND PAPER MILL SLUDGE,
Georgia Inst. of Tech., Atlanta. Dept. of Chemical Engineering.
G. R. Lightsey.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 820, $3.75 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No ERC-0975, July 1975. 21 p, 6 fig, 5 tab, 16 ref, append. OWRT A-059-GA(1) 14-31-001-5010.

Descriptors: *Waste water treatment, *Sludge disposal, *Trickling filters, *Pulp wastes, Nitrogen, Filtration, *Dewatering, *Sludge treatment, Industrial wastes, Chemical oxygen demand, Biochemical oxygen demand, Soil treatment.
Identifiers: *Sludge drying, Bark utilization, Pine bark.

Waste water treatment methods are of considerable importance to the pulp and paper industry to achieve prescribed environmental standards at a reasonable cost. Pine bark, an abundant manufacturing residue, is examined for its effectiveness for use first as a trickling filter medium and then as a soil amendment. Three trickling filter models were examined for their ability to remove BOD, COD, sodium, settleable matter, and color from a primary sludge stream from a clarifier. Conductivity and pH observations were recorded. Results indicate that pine bark as a filter medium is very effective in removing settleable matter from a primary sludge and BOD from the liquid fraction. The settlable matter is converted to a dewatered sludge at the filter face and BOD removal in the liquid is up to 95 percent. Blinding of the filter can be a problem if the dewatered sludge is not periodically removed. Experimental observations show that the BOD and COD removal efficiencies do not further change significantly after the liquid has passed through approximately three feet of the bark medium. The results suggest the optimum hydraulic loading rate for maximizing BOD and COD removal and minimizing filter size is larger than the maximum 4.59 gals. Ft-2day-1 rate tested in this study. Maximum BOD and COD removal were 95 and 42 percent, respectively, for the highest dosing rate. The nitrogen content of the pine bark medium significantly increases after approximately two months use as a filter medium. This strongly indicates that bark, after use as a trickling-filter medium, would have far greater value as a soil conditioner than raw bark.
W75-11241

CHANGES IN VEGETATION AND SURFACE SOIL PROPERTIES FOLLOWING IRRIGATION OF WOODLANDS WITH MUNICIPAL WASTEWATER,
Michigan State Univ., East Lansing. Dept. of Forestry.
For primary bibliographic entry see Field 5B.
W75-11243

TIME-VARIANT CHARACTERISTICS OF SELECTED WASTEWATER TREATMENT PLANTS OF NEVADA,
Nevada Univ., Reno. Desert Research Inst.
V. L. Gupta.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 822, $3.75 in paper copy, $2.25 in microfiche. Center for Water Resources Research, Reno, Project Report No 36, August 1975. 38 p, 14 fig, 6 tab, 11 ref. OWRT A-049-NEV(2), 14-31-0001-3838.

Descriptors: *Waste water treatment, Water quality control, *Treatment facilities, *Statistical methods, *Temporal distribution, *Distribution patterns, Probability.
Identifiers: Spectral analysis.

Six wastewater treatment plants in Nevada were analyzed for resultant effects on receiving water body quality caused by temporal variability of sewage effluent quality. The variation of the peak hourly flows caused by population was examined with efforts to develop an empirical equation usable for future planning of sewage collection works. The probability distributions of a variety of variables such as hourly influent flow, daily flow, influent and effluent biochemical oxygen demand and suspended solids, and in some instances, phosphate concentrations, were investigated. Results showed the significance of expressing treatment effectiveness in terms of statistical parameters rather than average values only. The study also revealed periodicities exist in a multitude of variables associated with the municipal wastewater treatment facilities. Engineering and scientific principles rather than purely empirical considerations should govern the design and operation of plant facilities. (Fallon-Nevada)
W75-11245

STATUS OF WASTE HEAT UTILIZATION AND DUAL-PURPOSE PLANT PROJECTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 3E.
W75-11251

WASTE WATER SURVEY, ST. REGIS PAPER COMPANY, CANTONMENT, FLORIDA.
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-228 275, $4.25 in paper copy, $2.25 in microfiche. August 1972. 52 p, 4 fig, 4 ref, 14 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, *Evaluation, Water pollution sources, Wastes, Industrial wastes, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Lignins, Color, *Florida, Ammonia, Phosphorus compounds, Nutrients, Settling basins, Aerated lagoons, Sewage treatment, Nutrient removal, Water pollution treatment, Water pollution control, Waste water(Pollution).
Identifiers: Total organic carbon, Kraft mills, Phosphoric acid, Perdido Bay(Fla), Elevenmile Creek(Fla), Bleached paper, Kraft paper, Perdido Bay Federal-State Enforcement Conference.

An evaluation is presented of waste treatment at St. Regis Paper Company's integrated kraft pulp and paper mill located at Cantonment, Florida. Reported results are from a 1972 study which was requested by the conferees at the Perdido Bay Federal-State Enforcement Conference Progress Meeting held in Gulf Breeze, Florida, during January, 1972. The field study was designed to determine the waste removal effectiveness of the mill's waste treatment facilities and to characterize the wastes discharged. Daily production during the survey averaged 830 tons of kraft pulp (543 tons of unbleached and 287 tons of bleached) and 785 tons of bleached and unbleached paper. Approximately 29 million gal/day of liquid wastes generated at the mill are discharged into Perdido Bay via Elevenmile Creek. The treatment facilities include a primary settling basin, nutrient feed system (anhydrous ammonia and phosphoric acid), three aeration ponds, and a final settling pond. Riffle terraces are located before and after the final pond. Waste loads and concentrations before and after treatment and percent reductions are as follows: BOD, 45,000 lb/day (210 mg/liter) and 4,050 lb/day (17 mg/liter), 91%; total organic carbon, 57,500 lb/day (264 mg/liter) and 29,300 lb/day (122 mg/liter), 49%; COD, 175,000 lb/day (814 mg/liter) and 83,400 lb/day (352 mg/liter), 52%; lignin-like compounds, 19,600 lb/day (91 mg/liter) and 17,300 lb/day (73 mg/liter), 12%; and color (Pt-Co units), 1,290 mg/liter and 1,100 mg/liter, 15%. About 90% of the total suspended solids load (49,200 lb/day) and total volatile suspended solids (30,000 lb/day) are removed in the treatment system. All of the N and P added by the nutrient feed system was not assimilated. (Witt-IPC)
W75-11314

VACUUM DISTILLATION/VAPOR FILTRATION WATER RECOVERY,
General American Transportation Corp., Niles, Ill.
R. J. Honegger, R. B. Neveril, and G. A. Remus.
Available from the National Technical Information Service, Springfield, Va 22161 as NASA-CR-120303, $3.75 in paper copy, $2.25 in microfiche. Summary Report for Phase III. April 1974. 40 p, 14 fig, 2 tab. Project No 1528. NAS 8-27467.

Descriptors: *Distillation, *Urine, *Water reuse, Potable water, Wastes, *Waste water treatment, Condensation, Water vapor, Gravity, Testing, Liquid wastes, Liquids, Equipment, *Filtration, Domestic wastes.
Identifiers: Human wastes, *Vacuum systems, Space technology.

Research activities preparatory to conducting low-gravity tests of a vacuum distillation/vapor filtration (VD/VF) system for recovering water from urine and humidity condensate are described. The VD/VF system comprises an evaporator, catalytic oxidation unit, and condenser, as well as auxilliary heat exchangers, valves, pumps, and controls. The evaporator boils urine and condensate into raw vapor, the catalytic oxidation unit removes organic contaminants and bacteria from the vapor, and the condenser condenses the vapor into potable water. A schematic flow diagram of the VD/VF system is given. Preparations for low-gravity testing described include analysis of liquid motion inside the evaporator during parabolic flights; installation of a transparent top on the evaporator and liquid deflectors within the evaporator; design of supports for VD/VF system components; design of a cooling unit; modification of various components, including sludge removal pump, drive motor and speed reducer for evaporator impeller, and oil-less vacuum pump; and frame fabrication and system assembly. The present status of low-gravity test preparations is assessed. (Witt-IPC)
W75-11315

CONSIDERATIONS FOR PREPARATION OF OPERATION AND MAINTENANCE MANUALS,
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
R. L. Green, G. L. Page, Jr., and W. M. Johnson.
Available Supt. of Doc., GPO, Washington, D.C. $2.85. EPA Report 430/9-74-001, 1973. 239 p, 21 fig, 80 ref, 2 tab. 68-01-0341.

Descriptors: *Treatment facilities, *Operation and maintenance, *Publications, Cities, *Waste water treatment, Maintenance, Equipment, Operations, Permits, Water quality standards, Sludge treatment, Personnel, Laboratory tests, Logging(Recording), Safety, Utilities, Electrical equipment, Pumping plants, Pipelines.
Identifiers: Emergency operation.

The preparation of municipal waste water treatment plant operation and maintenance manuals is discussed. The type of information to be included in each of the recommended chapters is described. The latter include: an introduction; discharge permits and water quality standards; description, operation, and control of waste water treatment facilities; description, operation, and control of sludge handling facilities; personnel requirements; laboratory testing; records; maintenance; emergency operating and response program; safety; utilities; and electrical system. Suggested manual outlines have been prepared for treatment plants and for pumping stations and pipelines. (Witt-IPC)
W75-11317

UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS MODIFICATIONS AND PRETREATMENT,
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
A. J. Steffen.
EPA Technology Transfer Seminar Publication, No. 1, Oct. 1973. 90 p, 23 fig, 9 tab, 18 ref, 2 append.

Descriptors: *Food processing industry, *Waste water treatment, *Industrial wastes, Pollution abatement, Water pollution treatment, Waste treatment, Treatment facilities, Odor.
Identifiers: *Meat packing industry.

This text, designed for owners, managers, superintendents, and operators of meat packing plants, deals with in-plant modifications for pollution abatement, including odor control, and pretreatment of waste waters prior to discharge to municipal sewage lines. Case histories are given. (See also W75-11321 and W75-11322) (Brown-IPC)
W75-11320

UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 2). WASTE TREATMENT,
Bell, Galyardt and Wells, Omaha, Nebr.
W. J. Wells, Jr., P. B. Wells, C. A. Haas, S. L. Hergert, and S. J. Brown.
EPA Technology Transfer Seminar Publication, No. 2, Oct. 1973. 64 p, 35 fig, 7 tab.

Descriptors: *Waste water treatment, *Food processing industry, Treatment facilities, Planning, Waste treatment, Pollution abatement, Water pollution treatment, *Industrial wastes, Water pollution sources.
Identifiers: *Meat packing industry.

The 7 chapters of this text deal with the need for wastewater treatment, the role of microorganisms, waste loads from meat packing factories, planning and design procedures for treatment facilities, treatment methods (anaerobic, aerobic lagoon, activated sludge, trickling filter, rotating biological disk, and irrigation), and maintenance and operation of waste treatment plants. Case histories and a survey of existing treatment facilities in the meat-processing industry are also given. (See also W75-11320 and W75-11322) (Brown-IPC)
W75-11321

UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 3). CHOOSING THE OPTIMUM FINANCIAL STRATEGY,
Commins (J. A.) and Associates, Inc., Fort Washington, Pa.
U. M. Patankar, and C. R. Marshall.
EPA Technology Transfer Seminar Publication, No. 3, Oct. 1973. 38 p, 10 fig, 6 tab.

Descriptors: *Food processing industry, *Waste water treatment, *Economics, Costs, *Financing, *Optimization, Pollution abatement, Water pollution treatment, Waste treatment, *Industrial wastes, Treatment facilities, Operation and maintenance, Capital cost, Depreciation, Decision making.
Identifiers: *Meat packing industry.

Detail topics discussed in the 7 chapters of this text include depreciation, financing strategies for pollution-control investments, state financing and tax incentives, and financial decisionmaking theory for municipal vs. private facilities. An illustration of optimizing financial strategy for pollution control is included. (See also W75-11320 and W75-11321) (Brown-IPC)
W75-11322

POLLUTION ABATEMENT IN A BREWING FACILITY.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Capsule Report No. 6, (1974). 17 p, 8 fig, 6 tab.

Descriptors: *Waste water treatment, *Treatment facilities, Biochemical oxygen demand, Suspended solids, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Capital costs, Operating costs, Costs, Water conservation, Byproducts, Sludge, *Colorado, Sewage treatment, Neutralization, Waste treatment, Activated sludge, Biological treatment, Food processing industry.
Identifiers: *Brewing industry, Hatfield process.

The brewing process and waste water treatment at Adolph Coors Company (Golden, Colorado) are described. Wastes generated from the combined brewing and malting operations amount to 3.3 million gal/day at a BOD level of 825 mg/liter. This is less than one-half the waste load produced by average breweries without malting facilities. The waste treatment facility provides primary treatment through neutralization and solids removal, and secondary treatment through a high-rate activated sludge system using a modification of the Hatfield process. Suspended solids are reduced by 90%, from 280 mg/liter to 29 mg/liter, and BOD is reduced by 96% to 34 mg/liter. Coors has realized sizable savings in the capital and operating costs for its waste treatment facility by reducing the raw wastes from the brewing plant through a program of water conservation, in-plant waste reduction, and recovery of waste materials as by-products. Preliminary feeding tests have shown that the dried sludge can be used as a high protein animal feed supplement. (Witt-IPC)
W75-11323

UPGRADING METAL-FINISHING FACILITIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS POLLUTION ABATEMENT,
Oxy Metal Finishing Corp., Madison Heights, Mich.
A. E. Olsen, and E. N. Hanf.
EPA Technology Transfer Seminar Publication, No. 1, July 1973. 69 p, 32 fig, 4 tab, 14 ref, 2 append.

Descriptors: *Metals, *Chemical wastes, *Waste water treatment, *Water pollution treatment, *Pollution abatement, Water pollution sources, Corrosion control, Equipment, *Industrial wastes, Effluents, Ventilation, Air pollution.
Identifiers: *Metal finishing wastes.

The 3 chapters of this text deal with water and air pollution control measures and devices, as well as with corrosion protection of floors and equipment in various types of metal-finishing plants. Case histories and examples are included. (See also W75-11325) (Brown-IPC)
W75-11324

UPGRADING METAL-FINISHING FACILITIES TO REDUCE POLLUTION. (PART 2). WASTE TREATMENT,
Lancy Labs., Inc., Zelienople, Pa.
L. E. Lancy, and R. L. Rice.
EPA Technology Transfer Seminar Publication, No. 2, July 1973. 47 p, 24 fig, 2 tab, 40 ref.

Descriptors: *Metals, *Waste water treatment, *Pollution abatement, *Chemical wastes, *Water pollution treatment, Water pollution sources, Economics, Sludge disposal, Sludge treatment, Dewatering, Separation techniques, Ion exchange, Reverse osmosis, Evaporation, Industrial wastes.
Identifiers: Chemical recovery, *Metal finishing wastes.

Metal-finishing processes requiring pollution control are discussed, along with commonly used waste-treatment systems (batch, continuous, and integrated). The regeneration of process solutions and metal recovery (by evaporation, ion-exchange, and reverse osmosis) are dealt with in detail, including economic considerations. The final chapter considers solid-liquid separation, solids concentration, and sludge handling and disposal. (See also W75-11324) (Brown-IPC)
W75-11325

UPGRADING TEXTILE OPERATIONS TO REDUCE POLLUTION. (PART 1). IN-PLANT CONTROL OF POLLUTION.
Institute of Textile Technology, Charlottesville, Virginia.
EPA Technology Transfer Seminar Publication, EPA-625/3-74-004, No. 1, Oct. 1974. 118 p, 14 fig, 50 tab, 28 ref, 2 append.

Descriptors: *Pollution abatement, *Waste water treatment, *Textiles, Chemical wastes, Air pollution, Water pollution sources, Industrial water, Monitoring, Data collections, Water reuse, Flow control, Water supply, Foaming.
Identifiers: *Textile industry wastes.

Current practices in the technology of waste water management (waste survey, major sources of pollution, and flow reduction) are discussed, along with air pollution abatement (emissions survey, particulate control, and solvent recovery) in the textile industry. Some of the details dealt with include pretreatment of textile wastes prior to discharge, case histories of flow reduction and water reuse, substitution of processes and materials and their effects on pollution abatement, and the reduction of wastewater foaming. (See also W75-11327) (Brown-IPC)
W75-11326

UPGRADING TEXTILE OPERATIONS TO REDUCE POLLUTION. (PART 2). WASTE-WATER TREATMENT SYSTEMS.
Metcalf and Eddy, Inc., Boston, Mass.
EPA Technology Transfer Seminar Publication, EPA-625/3-74-004, No. 2, Oct. 1974. 45 p, 10 fig, 16 tab, 4 ref.

Descriptors: *Textiles, *Waste water treatment, *Chemical wastes, Pollution abatement, Water pollution treatment, Activated carbon, Biological treatment.
Identifiers: *Textile industry wastes.

The 5 chapters of this text discuss the need for textile industry wastewater treatment, sources and strengths of these wastewaters, biological treatment methods, and granular activated carbon treatment. Case histories are also cited. (See also W75-11326) (Brown-IPC)
W75-11327

UPGRADING POULTRY-PROCESSING FACILITIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS POLLUTION ABATEMENT,
Environmental Engineering, Inc., Gainesville, Fla.
R. H. Jones, J. D. Crane, T. A. Bursztynsky, and J. A. Macon.
EPA Technology Transfer Seminar Publication, No. 1, July 1973. 28 p, 1 fig, 5 tab, 6 ref.

Descriptors: *Food processing industry, *Poultry, *Waste water(Pollution), *Water management(Applied), Industrial water, Equipment, Pollution abatement, Waste water treatment, Water supply, Industrial wastes.
Identifiers: *Poultry processing wastes.

The supply and management of poultry-processing water is discussed, including a case history and practical recommendations for waste water control and equipment changes. (See also W75-11329 and W75-11330) (Brown-IPC)
W75-11328

UPGRADING POULTRY-PROCESSING FACILITIES TO REDUCE POLLUTION. (PART 2). PRETREATMENT OF POULTRY-PROCESSING WASTES,
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
A. J. Steffen.
EPA Technology Transfer Seminar Publication, No. 2, July 1973. 54 p, 22 fig, 3 tab, 13 ref.

Descriptors: *Poultry, *Food processing industry, *Waste water treatment, *Industrial wastes, Pollution abatement, Regulation, Legislation, Economics, Costs.
Identifiers: *Poultry processing wastes.

The 5 chapters of this discussion examine conditions for the pretreatment of poultry-processing wastewater prior to discharge into a municipal sewage system (e.g., for legal reasons and/or to economize on final treatment costs), as well as the type of pretreatment to be selected (none, secondary screening, solids separation, and/or biological or chemical treatment) and factors to be considered in the decision. (See also W75-11328 and W75-11330) (Brown-IPC)
W75-11329

UPGRADING POULTRY-PROCESSING FACILITIES TO REDUCE POLLUTION. (PART 3). WASTE TREATMENT.
Giffels Associates, Inc., Detroit, Mich.
EPA Technology Transfer Seminar Publication, No. 3, July 1973. 48 p, 24 fig, 5 tab.

Descriptors: *Treatment facilities, *Food processing industry, *Poultry, Waste water treatment, Water pollution treatment, Pollution control, Water pollution sources, Costs.
Identifiers: *Poultry processing wastes.

Reasons and planning for waste water treatment in poultry-processing plants, the operation of treatment systems, and a case history are discussed, including site selection, waste water surveys, process selection, design criteria, expansion provisions, system costs, operating difficulties, and proposed modifications. (See also W75-11328 and W75-11329) (Brown-IPC)
W75-11330

EFFLUENT CHARACTERISTICS AND TREATMENT OF MECHANICAL PULPING EFFLUENTS,
B.C. Research, Vancouver(British Columbia).
T. E. Howard, and C. C. Walden.
International Mechanical Pulping Conference, San Francisco, June 16-20, 1975, (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 197-201. 1 fig, 4 ref, 4 tab.

Descriptors: *Pulp wastes, *Biochemical oxygen demand, *Toxicity, *Fish, Rainbow trout, Industrial wastes, Wastes, Water pollution sources, Water pollution effects, Water pollution, Aerobic treatment, Activated sludge, Waste water treatment, Flocculation, Waste treatment, Water pollution control, Lagoons, Economics.
Identifiers: *Mechanical pulping, *Total organic carbon.

This study assessed the 5-day BOD, total organic carbon, and toxicity to fish of mechanical pulping effluents where the effluent is not contaminated by barking wastes or brightening aids. The raw effluent was toxic to rainbow trout with the median tolerance limit, 96 hr-LC(50), normally between 4-10% (volume/volume) and the median survival time in 65% concentration frequently as low as 20 minutes. The BOD ranged from 300 to 1400 mg/liter and the total organic carbon was about 400 mg/liter. Aerobic microbiological fermentation either in activated systems or in 5-day lagoon systems reduced the BOD by as much as 97% and total organic carbon correspondingly. All systems effectively detoxified the waste unless activity was limited by temperature, as in the case of a system operated at 1 C. Flocculation was not effective. The economics of treatment are discussed briefly as are the interrelationships of effluent characteristics. The only useful relationship was between 5-day BOD and total organic carbon. (See also W75-11332) (Witt-IPC)
W75-11331

MILL EXPERIENCE IN THE TREATMENT OF MECHANICAL PULPING EFFLUENT,
B.C. Research, Vancouver (British Columbia).
T. E. Howard, R. G. Leslie, and N. E. Ward.
International Mechanical Pulping Conference, San Francisco, June 16-20, 1975 (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 202. 1 fig, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Aerobic treatment, *Biological treatment, Lagoons, Oxidation ponds, Biochemical oxygen demand, Toxicity, Winter, Seasonal, Heating, Natural gas, Temperature control, Industrial wastes, Wastes, Water pollution sources, Water pollution treatment, Water pollution control, Foreign countries, Canada.
Identifiers: *Mechanical pulping, Finlay Forest Industries Ltd.(Canada).

Refiner-groundwood pulping effluent at Finlay Forest Industries Ltd. (Mackenzie, British Columbia) is treated by an aerobic microbiological system (consisting of a primary lagoon, 3-day aerated stabilization basin, and final aeration lagoon) to reduce BOD and remove toxicity. Detoxification of the effluent during winter months (November-February) has been improved by installing submerged natural gas heaters ahead of the 3-day lagoon to maintain the temperature of the effluent around 18 C. (See also W75-11331) (Witt-IPC)
W75-11332

PAPERMAKING COMPLEX AT DUNAUJVAROS (HUNGARY) -- PRESERVING THE DANUBE (AU COMPLEXE PAPETIER DE DUNAUJVAROS -- PRESERVER LE DANUBE),
Kipinvest, Budapest (Hungary).
P. Gati, and C. Maric.
Papier, Carbon et Cellulose, Vol 24, No 5, p 42-47, May, 1975. 1 fig, 4 illus, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, Industrial wastes, Wastes, Water pollution sources, Biological treatment, Water purification, Sludge treatment, Dewatering, Filtration, Aeration, Water pollution treatment, Water pollution control, Europe, Pulp and paper industry.
Identifiers: *Hungary, Corn stalks, Kraft mills, Groundwood mills, Writing papers, Printing papers.

The pulp and paper complex at Dunaujvaros includes a 22,000 ton/year kraft pulp mill processing corn stalks, a 15,000 ton/year groundwood mill, and a 70,000 ton/year writing and printing paper mill. Plans call for the installation of a semichemical pulp mill, a linerboard and corrugating medium machine, and a box plant in 1976. Internal measures for reducing pollution at the complex are outlined, including the planned chemical cross-recovery system. A description is presented of the effluent treatment system being developed, which includes physical-chemical clarification plus biological purification (activated sludge aeration plus secondary clarification). Sludge thickening and filtration procedures are also mentioned. (Speckhard-IPC)
W75-11333

SOLUTE-SOLUTE INTERACTIONS IN ULTRAFILTRATION TREATMENT OF PAPER MILL WASTES,
North Carolina State Univ., Raleigh. Dept. of Chemical Engineering.
H. B. Hopfenberg, V. T. Stannett, and M. W. Bailey.
American Institute of Chemical Engineers, Symposium Series, Vol 70, No 139, p 1-10, 1974. 14 fig, 22 ref, 1 tab.

Descriptors: *Waste water treatment, *Reverse osmosis, *Inorganic compounds, Industrial wastes, Wastes, Water pollution sources, Membrane processes, Separation techniques, Waste treatment, Membranes, Water pollution treatment, Water pollution control, Electrolytes, Gels, Permselective membranes.
Identifiers: *White water, *Starch, Cellulose acetate membrane.

The effect of interactions between starch and various inorganic salts on flux-limiting phenomena in the ultrafiltration of salt-starch-water solutions was studied. These ternary solutions were formulated to model a paper mill white water and contained a commercial papermaker's oxidized starch and one of several salts (sodium chloride, sodium sulfate, magnesium chloride, magnesium sulfate, aluminum chloride, or aluminum sulfate). The test loop employed an Eastman Chemicals KP-90 asymmetric cellulose acetate membrane. The results showed a reduction in product flux of up to 70% from the pure water flux when a starch-salt solution was treated, indicating that process equipment may be undersized by a factor of 4 if these flux-limiting interactions between solutes are ignored. In an aqueous solution of oxidized starch, the starch chain is in an expanded configuration, due to repulsion of like charges from the ionized COOH groups along the chain. By adding an electrolyte, the charges on the chain are shielded by the counterions, allowing the polymer chain to coil more densely. The shielded starch molecules form less viscous solution and, ultimately, a denser gel than they would without shielding. Gel formation on the membrane surface caused by the preferential accumulation of starch at the solution-membrane interface adds an additional resistance to water transport through the membrane. The interaction between starch and salt is a consequence of the charge on the polymer, and the resistance to water transport was shown to increase with increasing concentration of starch and/or salt and with decreasing charge frequency on the starch molecule. (Witt-IPC)
W75-11334

EVALUATION OF THE ADSORPTIVE PROPERTIES OF FLY ASH WITH REFERENCE TO A PULP AND PAPER MILL WASTE EFFLUENT,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
R. C. Whittemore.
U.S. Bureau of Mines, Information Circular IC 8640, p 296-317, 1974. 50 ref, 14 tab.

Descriptors: *Fly ash, *Bleaching wastes, *Color, *Waste water treatment, Biochemical oxygen demand, Chemical oxygen demand, Wood wastes, Bark, Water pollution sources, Wastes, *Industrial wastes, Water pollution treatment, Water pollution control, Lime, *Waste treatment.

The adsorptive properties of fly ash from boilers that burned wood wastes and bark along with auxiliary fuels (oil and gas), from a coal-burning boiler, and from coal- and bark-fired boilers were studied. The results showed that the fly ash in general did not have conventional adsorptive properties comparable to a commerical-grade activated carbon. Softwood-bark-derived fly ash adsorbed iodine and phenol better than the hardwood-bark-derived fly ash. The study also indicated that the ability of a fly ash to be used effectively in the treatment of a particular pulp and paper mill waste was proportional to its lime (CaO) content. Hardwood bark fly ash had a high lime content and was most effective in removing caustic bleaching effluent color, COD, and 5-day BOD. (Witt-IPC)
W75-11335

SOME OBSERVATIONS CONCERNING PREPARATION AND STORAGE OF STREAM SAMPLES FOR DISSOLVED INORGANIC PHOSPHATE ANALYSIS,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W75-11336

WORKSHOP ON COMPUTER-AIDED DESIGN AND SIMULATION OF WASTE TREATMENT SYSTEMS.
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
Department of the Environment, Report No (Training Manual) EPS 6-WP-74-1, January, 1974, 454 p.

Descriptors: *Waste water treatment, *Treatment facilities, *Design, *Model studies, *Computer models, Computer programs, Mathematical models, Sanitary engineering, Sewage treatment, Water pollution treatment, Water pollution control, Waste treatment.

This volume contains the notes from a workshop conducted for Environmental Canada by B and P Silveston, Engineers (Kitchener, Ontario) in January, 1974, on the application of computers in waste treatment plant design and planning studies. The individual chapters cover the objectives and organization of the workshop, usefulness of computers in process design and simulation, process systems analysis, the SEPSIM (Short Executive Program for SIMulation) software, model development, and mathematical models for a wide variety of waste treatment processes. An appendix describes the applications and operation of the SEPSIM program. (Witt-IPC)
W75-11338

MEASURES IN THE SULFITE PULP INDUSTRY FOR DECREASING WASTE WATER LOAD (MASSNAHMEN DER SULFITZELLSTOFF-INDUSTRIE ZUR MINDERUNG DER ABWASSER-BELASTUNG),
Chemiefaser Lenzing A.G. (Austria).
R. Hornke, and H. Danninger.
Das Papier, Vol 29, No 6, p 241-245, June, 1975. 5 fig, 3 ref, 1 tab.

Descriptors: *Pulp and paper industry, *Waste water treatment, *Water pollution, Sulfite liquors, Bleaching wastes, Industrial wastes, Wastes, Water pollution sources, Neutralization, Biological treatment, Biochemical oxygen demand, Water pollution control, Water pollution treatment.
Identifiers: Chemiefaser Lenzing AG.(Austria), Austria, Evaporator condensates, Sulfite mills.

Following a short review of the origins of waste water loads during the operation of a sulfite pulp mill, measures being taken or planned at the mill of Chemiefaser Lenzing AG. (Austria) are described. A differentiation is made between measures for digester discharge, condensates from spent liquor evaporation, and bleach plant effluents. The target is a spent liquor retention of 99.3%, neutralization of evaporator condensates, and treatment of the bleaching waste water in a biological or other decomposition stage, with the desired result of a total discharge of only 6 tons or 5-day BOD per day. (Speckhard-IPC)
W75-11339

EFFECT OF LIME TREATMENT ON MOLECULAR WEIGHT DISTRIBUTION OF COLOR BODIES FROM KRAFT LINERBOARD DECKER EFFLUENTS,
Institute of Paper Chemistry, Appleton, Wis.
H. S. Dugal, J..W. Swanson, E. E. Dickey, and M. A. Buchanan.
Tappi, Vol 58, No 7, p 132-135, July, 1975. 4 fig, 12 ref, 4 tab.

Descriptors: *Pulp wastes, *Lime, *Color, *Waste water treatment, Industrial wastes, Wastes, Water pollution sources, Water pollution treatment, Waste treatment, Effluents, Solubility, Pulp and paper industry, Freeze drying.
Identifiers: *Molecular weight, Decker effluents, Kraft linerboard, Total organic carbon, Sugars, Board mills.

Concentrated aqueous solutions of freeze-dried solids from kraft linerboard decker effluents (before and after lime treatment) were acidified to give acid-insoluble and acid-soluble fractions in experiments designed to allow the isolation and characterization of the colored components of dilute kraft waste liquors. About 63% color was obtained as an acid-insoluble fraction when the effluent not treated with lime was acidified, and only 26% when lime-treated effluent was acidified. Lime treatment removed approximately 86% of the color, 57% of the total organic carbon, and 17% of the reducing sugars from the decker effluent. Apparent weight-average molecular weights of the acid-insoluble color bodies before lime treatment varied from less than 400 to 30,000 and after lime treatment from less than 400 to 5,000. Acid-soluble color bodies, before and after lime treatment, ranged from less than 400 to 5,000. Color bodies having a weight-average molecular weight of less than 400 were not removed by lime treatment, and those above 5,000 were completely removed. Color bodies in the intermediate range (weight-average molecular weight 400-5,000) were apparently partially removed. (Sykes-IPC)
W75-11345

BIODEGRADATION OF COMPONENTS OF PULP WASTE EFFLUENTS BY BACTERIA. (I). DEGRADATION OF KRAFT LIGNIN (IN JAPANESE),
Nagoya Univ. (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W75-11346

TREATING EFFLUENTS FROM A SULPHITE PULP MILL BY FLOTATION,
Ahlstrom (A.) Osakeyhtio, Varkaus (Finland). Paper and Pulp Div.
G. Norrman, and B. Myreen.
Paperi ja Puu, Vol 57, Special issue No 4a, p 177-179, 181-182, April, 1975. 5 fig, 6 ref, 1 tab.

Descriptors: *Sulfite liquors, *Flocculation, *Waste water treatment, *Flotation, Industrial wastes, Wastes, Water pollution sources, Waste treatment, Water purification, Water pollution, Water pollution control, Efficiencies, Effluents, Regression analysis, Europe, Pulp and paper industry.
Identifiers: Sodium aluminate, Polyacrylamide, Polyamide-amine, Sulfite pulp mills, Finland.

Effluents from a Finnish calcium-base sulfite mill were subjected to purification by chemical flotation. The effects of different flocculants (sodium aluminate, polyacrylamide, polyamide-amine) and other variables (water pH, air content, surface loading, retention tank pressure, coagulant dosage) on the efficiency of the flotation plant were analyzed by regression techniques. Type of flocculant was found to have the greatest effect. Best results under the particular operating conditions of this installation were obtained with polyacrylamide. Sodium aluminate was better than no flocculant, but was sensitive to pH variations and required a high retention tank pressure. The polyamide-amine used was not particularly effective. (Brown-IPC)
W75-11347

STUDY OF ELECTROCHEMICAL TREATMENT METHOD FOR REMOVING COLLOIDAL PARTICLES FROM PULP AND PAPER INDUSTRY EFFLUENTS (TUTKIMUS SELLUTEOLLISUUDEN JATEVESIEN KOLLOIDAALISTEN AINESTEN POISTOMAHDOLLISUUDESTA SAHKOKEMIALLIESTI),
Helsinki University of Technology, Otaniemi (Finland). Dept. of Metallurgy.
P. J. Tunturi.
Paperi ja Puu, Vol 57, Special Issue No 4a, p 235-238, 241-244, April, 1975. 6 fig, 11 ref, 5 tab. English summary.

Descriptors: *Waste water treatment, *Electrochemistry, *Colloids, Industrial wastes, Pulp and paper industry, Wastes, Water pollution sources, Waste treatment, *Flocculation, Water purification, Suspended solids, Neutralization, Stabilization, Electric fields, Anodes, Corrosion control, Corrosion, Steel, Effluents, Water pollution control, Water pollution, Water pollution treatment, Foreign research, Europe, Chemical wastes.
Identifiers: *Finland.

Effluents of forest, chemical, and metal-working industries often contain colloidal particles difficult or impossible to remove by normal treatments. In a 1970 study of cathodic protection of steel against corrosion by pulp mill waste waters, sudden clarification with flock formation was noticed in dark waste waters containing much suspended solids. Charge neutralization and stabilization of colloids by the strong electric field was suspected, but the phenomenon was nonreproducible. Studies resumed in 1974 at the Metallurgy Department of Helsinki's Technological University indicated that the electric field along could not stabilize the colloids, but that conditions suitable for neutralizing the colloids could be achieved by simultaneous anodic dissolution of Al or Fe flock. (Brown-IPC)
W75-11348

POSSIBILITIES OF REUTILIZATION OF KAOLIN FROM BIOLOGICAL WASTE WATER SLUDGES (MOEGLICHKEITEN DER WIEDERVERWERTUNG VON KAOLIN AUS BIOLOGISCHEN ABWASSERCHLAEMMEN),
Papierfabrik Biberist (Switzerland).
J. C. Ulrich.
Das Papier, Vol 29, No 6, p 245-247, June, 1975. 1 fig, English summary.

Descriptors: *Sludge treatment, *Incineration, *Industrial wastes, Wastes, Sludge disposal, Abrasion, Pulp and paper industry, Water pollution sources, Sludge, Clays, *Waste treatment, Recycling, *Water reuse.
Identifiers: *Kaolin, Chemical recovery, Papierfabrik Biberist(Switerzerland), Switzerland, Mullite.

The reuse of kaolin from biological waste water sludges could be of interest in the case of sludge burning. Because the biological sludge of Papierfabrik Biberist (Switzerland) contains 60-70% kaolin, the possibilities of kaolin recovery are being investigated. During incineration, the conversion of kaolin into mullite must be prevented, because mullite has an abrasive effect. This fact is decisive for the choice of a suitable incinerator. Investigations are in full progress; final results are not yet available. (Speckhard-IPC)

W75-11349

5E. Ultimate Disposal Of Wastes

ILLINOIS LANDFILL LAW MAY EFFECT NEARBY STATES.
For primary bibliographic entry see Field 5B.
W75-11011

SOME OBSERVATIONS ON BEHAVIOR OF THE TREATED SEWAGE DISPOSED IN THE SEA,
Nihon Univ., Tokyo (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5B.
W75-11020

PROCESS FOR TREATING SEWAGE SLUDGE,
American Cyanamid Co., Stamford, Conn. (assignee)
For primary bibliographic entry see Field 5D.
W75-11064

MOBILE UNIT FOR TREATING LIQUID WASTE,
Chemfix, Inc., Pittsburgh, Pa. (assignee)
For primary bibliographic entry see Field 5D.
W75-11073

PROBLEMS OF LIQUID WASTE DISPOSAL,
New South Wales Univ., Kensington (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W75-11112

THE USE OF SOIL AS A PURIFYING SYSTEM (L'UTILISATION DU SOL COMME SYSTEME EPURATEUR),
Institut National de la Recherche Agronomique, Dijon (France). Laboratoire de Microbiologie des Sols.
For primary bibliographic entry see Field 5D.
W75-11126

DESIGN CONSIDERATIONS--WATER AND EFFLUENT DISPOSAL,
For primary bibliographic entry see Field 5D.
W75-11128

DESIGN OF THE OPTIMAL OUTFALL SYSTEM FOR A STREAM RECEIVING THERMAL AND ORGANIC WASTE DISCHARGES,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5B.
W75-11137

BARK AS TRICKLING-FILTER DEWATERING MEDIUM FOR PULP AND PAPER MILL SLUDGE,
Georgia Inst. of Tech., Atlanta. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W75-11241

SOLID WASTES, ANIMAL REFUSE, AND ORGANIC RESIDUES DISPOSAL, AND THE QUALITY OF GROUND WATER,
Tuskegee Inst., Ala. School of Applied Sciences.
For primary bibliographic entry see Field 5B.
W75-11244

POSSIBILITIES OF REUTILIZATION OF KAOLIN FROM BIOLOGICAL WASTE WATER SLUDGES (MOEGLICHKEITEN DER WIEDERVERWERTUNG VON KAOLIN AUS BIOLOGISCHEN ABWASSERCHLAEMMEN),
Papierfabrik Biberist (Switzerland).
For primary bibliographic entry see Field 5D.
W75-11349

5F. Water Treatment and Quality Alteration

THE RESPONSIBILITY OF U.S. WATER SUPPLIERS,
Senate, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10856

ORGANIC COLOR IN GROUNDWATER OF MISSISSIPPI,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
M. T. Bond, and J. E. Bowie.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 507, $4.25 in paper copy, $2.25 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1975. 56 p, 12 fig, 4 tab, 16 ref, 7 append. OWRT A-084-MISS(1).

Descriptors: *Color, Water quality, Groundwater, Water supply, *Mississippi, Water wells, Polyelectrolytes, Waste treatment, *Water treatment, Hydrogen ion concentration.
Identifiers: Organic color.

The objectives were to identify the substances in groundwater that produce organic color and to evaluate techniques to remove the color from water supplies. Eight wells having very little or no iron content were selected as sampling sites for preliminary characterization studies. Organic colors ranged from 15 units to 140 units. All samples had a pH between 8.3 and 8.7. An analysis of the color material in the water strongly indicated that it was a tannin and lignin like substance. A near linear correlation exists between tannin and lignin concentrations and color units in water. Organic color could be removed from groundwaters most effectively by adjusting the pH downward and adding alum and a polyelectrolyte at a proper dosage. Alum requirements were 60-70 mg/l for all waters at a pH of approximately 6. The polyelectrolyte requirements varied with the intensity of color. Activated carbon is not an effective method to remove organic color greater than 40, and possibly much lower, from groundwater. It may be effective to remove residual color after chemical physical treatment.
W75-10907

DISINFECTING WASTEWATER WITH CHLORINATION/DECHLORINATION PART 1,
For primary bibliographic entry see Field 5D.
W75-10963

DISINFECTING WASTEWATER WITH CHLORINATION/DECHLORINATION PART 2,
For primary bibliographic entry see Field 5D.
W75-10964

LIQUID CO2 PROTECTS OUR WATER'S QUALITY,
Kansas City Water Dept., Mo.
D. R. Boyd.
The American City, Vol 90, No 1, p 57-58, March, 1975. 2 fig.

Descriptors: *Water quality, *Carbon dioxide, *Water purification, Costs, Lime, Flow rates, *Water treatment, Missouri, Waste water treatment.
Identifiers: *Recarbonization, Kansas City(Mo).

The Kansas City, Missouri, Water Department utilizes recarbonization as an essential step in their water purification method. This step is used to neutralize and stablize the water after it has been softened with lime. In the past the Kansas City plant produced their own carbon dioxide with on-site generators. They are now using commercial carbon dioxide. The advantages of using liquid carbon dioxide are cost, superior purity and quality of gas, no contamination of the water, shorter filter runs, and prevention of carbon monoxide formation. The Kansas City plant processes an average of 105 mgd with a high of 178 mdg and low of 85 mgd using an average of 339 pounds of carbon dioxide vapor per million gallons of water for recarbonization. The liquid carbon dioxide is stored in 4 fiberglass insulated refrigerated low-pressure tanks with a 24-ton capacity each. In the recarbonization basins the water passes in an undulating motion over and under a series of transverse verticle baffles. The excess alkalinity of the water is neutralized to a pH of 9.7 by the carbon dioxide. (Dean-FIRL)
W75-10990

A WATERBORNE GASTROENTERITIS EPIDEMIC IN PICO RIVERS, CALIFORNIA,
Los Angeles County Health Services Dept., Calif. Immunization Project.
L. E. Mahoney, C. T. H. Friedmann, R. A. Murray, E. L. Schulenburg, and G. A. Heidbreder.
American Journal of Public Health, Vol 64, No 10, p 963-968, October 1974. 3 fig, 4 tab, 10 ref.

Descriptors: *Public health, *Epidemics, *Chlorination, *Water supply, Reservoirs, Coliforms, *California, Water treatment, Water pollution effects.
Identifiers: *Sewage poisoning, Fecal coliform, Gastroenteritis, Pico Rivera(Calif).

An outbreak of acute nonspecific gastroenteritis occurred between July 29 and August 7, 1971 when about 11,000 residents of Pico Rivera, California, became ill. Symptoms included diarrhea, stomach cramps, nausea, vomiting, fever, and menatochezia. These symptoms are compatible with the syndrome of sewage poisoning. Sanitary and epidemiology investigations determined that the source of the illnesses was water from a reservoir serving part of the town. Chlorination at the reservoir was interrupted for about a week starting July 29, 1974 due to an unattended chlorinator that was out of chlorine. The area served by the reservoir showed heavy fecal coliform contamination in water samples taken. The contamination was further localized to a portion of the water line. Although the common feeling is that waterborne gastroenteritis outbreaks in the United States are things of the past, current statistics suggest that common source outbreaks of waterborne disease may continue to occur with some frequency. (Orr-FIRL)
W75-11005

INDUCED INFILTRATION SUPPLY SYSTEM AMONG BIGGEST.
Water and Pollution Control, Vol 112, No 9, p 33, 38-39, September 1974. 2 fig.

Descriptors: *Water supply, *Aquifers, *Infiltration, Water resources, Pumps, Costs, *Canada, Water treatment, Facilities, Construction.
Identifiers: *Fehlmann collector, *Induced infiltration.

An induced infiltration supply system including pump house for a water supply system has recently been installed for the City of Prince George, British Columbia. The system cost around $1.2 million which was a 44% saving over the estimated cost of a river intake and treatment plant. In addition to the capital cost saving, there will be annual operating cost savings in the form of chemical treatment, operation and maintenance costs associated with surface water treatment plants. The completed project includes a Fehlmann collector, one of the highest capacity ground water collectors in the world. An investigation was done to

determine the best method of supplying water which included drilling and logging test wells, constructing temporary pumped wells, and aquifer testing an extensive glacial outwash area along the Nechako River. The Fehlmann collector is guaranteed to produce a minimum of 10 mgd up to a maximum of 15 mgd. The collector consists of a 16 ft inside diameter caisson of reinforced 4000 psi high early strength concrete with 1.5 ft thick walls and a bottom of 6 ft thick reinforced concrete. Other specifications and details of construction and operation are given. (Orr-FIRL)
W75-11010

BIOLOGICAL CONTROL: ISOLATION AND BACTERIAL OXIDATION OF THE TASTE-AND-ODOR COMPOUND GEOSMIN,
Detroit Univ., Mich. Dept. of Biology.
L. V. Narayan, and W. J. Nunez.
Journal of the American Water Works Association, Vol 66, No 9, p 532-536, September, 1974. 6 fig, 2 tab, 13 ref.

Descriptors: *Biodegradation, *Odor-producing algae, *Odor, *Bacteria, Taste, Water quality, Biological treatment, *Biocontrol, Microbial degradation, Oxidation, Microorganisms, Isolation, Water supply.
Identifiers: Bacillus sp, *Geosmin, Anabaena circinalis.

A variety of microorganisms have been cited as the causes of naturally occurring tastes and odors in water supplies. The two most important of these microbial odor causing compounds are mucidione and geosmin. The isolation of geosmin from Anabaena circinalis, determination of the threshold odor level, enrichment culturing of microorganisms, cell cultivation and collection, and oxidative degradation were studied. Geosmin was found to be the primary odor component in Anabaena circinalis. The distillation and extraction of the entire algal culture of Anabaena circinalis, cells and medium, yielded more geosmin than distilling the algal cells along. The geosmin in the medium was probably the result of a release of metabolites during physiological transitions of the algal culture. Manometric oxidation studies were found to be useful for scanning microorganisms as agents for controlling taste and odor compounds in water. Sarcina sp., Micrococcus sp., Mima sp., Escherichia coli, Alcaligenes viscolactis, and Bacillus sp. were all examined in regard to their ability to degrade geosmin. Bacillus sp. appeared to be the best bacterial organisms for biological control of odor causing metabolites. Bacillus cereus strain 10876 has previously been reported as the best strain of bacteria for the degradation of geosmin. However, Bacillus subtilis strains and Bacillus cereus strain ATCC 9139 proved to be as effective as Bacillus cereus strain 10876 in degrading geosmin. (Orr-FIRL)
W75-11013

CITY/TOWNSHIP JOINT VENTURE--A NEW WATER PLANT,
East Lansing-Meridian Water and Sewer Authority, East Lansing, Mich.
W. K. Kyes.
Water and Sewage Works, Vol 232, No 8, p 88-91, August, 1974. 3 fig.

Descriptors: *Water treatment, *Water supply, *Domestic water, Water softening, Hardness(Water), Water purification, Water wells, Filters, Treatment facilities, *Michigan.
Identifiers: East Lansing(Mich), Meridian Township(Mich).

The East Lansing-Meridian Water and Sewer Authority was formed in 1969 to provide a sufficient quantity of fully treated water to the City of East Lansing and adjoining Meridian Township. A water treatment plant was put in operation in 1973 which provides 15 mgd of water containing 85 mg/liter or less of hardness and no iron. The plant incorporates an in-house lime handling system to transfer the pebble lime from large storage bins to day bins positioned over the lime feeders. Pretreatment is provided in two primary clarifiers and two secondary clarifiers. Mixing, flocculation and sedimentation are performed in one tank. Wood plank deck and laminate wood beams were chosen to cover the pretreatment tanks because of the lower capital cost than that of a concrete roof and the lack of future maintenance requirements. A concrete roof would have cost more and required periodic painting. After pre-treatment, the water is applied to dual media (sand covered by anthracite) gravity sand filters for removal of chemical floc. Lime soda softening of the water results in two waste by-products: the backwash water is stored in an earthen pond and recycled to the inlet of the plant; the line sludge is stored a lagoon system where the solids settle out and the clear supernatant left is collected and pumped back to the plant. The plant functions with semi-automatic controls. Sixteen new wells, more than 9 miles of pipe to transport the water to the plant and 2 miles of distribution mains were developed in conjunction with the water treatment plant. (Orr-FIRL)
W75-11015

HOW SILICA AFFECTS IRON REMOVAL FROM GROUNDWATER,
Yule, Jordan and Associates, Camp Hill, Pa. Environmental Engineering Div.
L. R. Robinson, Jr.
Water and Sewage Works, Vol 122, No 3, p 74-77, March, 1975. 9 tab, 18 ref.

Descriptors: *Groundwater, *Water treatment, Iron, *Oxidation, *Silica, Hydrogen ion concentration, Alkalinity, Pilot plants, Laboratory tests, *Waste water treatment.
Identifiers: *Iron removal.

Interference with iron oxidation and removal is frequently attributed to low pH and low alkalinity concentrations. It has also been indicated that high concentrations of silica can catalyze ferrous iron oxidation and retard hydrolysis of ferric iron and thus hinder sedimentation and filtration. The results of both jar tests and pilot plant studies indicate that silica interference with iron removal is apparently the reaction of silica in alkalinity determinations to indicate sufficiently high bicarbonate alkalinity to insure rapid ferrous iron oxidation. When lime or soda ash were added, satisfactory iron oxidation and removal was achieved. These results confirm the hypothesis that a bicarbonate alkalinity of at least 100 mg/liter as CaCO3 is necessary to obtain immediate oxidation and subsequent removal or iron from groundwater. Tests were performed on several groundwater supplies in East Pakistan where poor iron removal was obtained even though alkalinities were found to be in excess of 100 mg/liter. Silica was observed in significant concentration in several of the waters studied. Where treatability was unsatisfactory, the addition of lime or soda ash was successful in causing the oxidation of the iron. The addition of silica in the form of sodium metasilicate had no effect on the treatability of the water. (Orr-FIRL)
W75-11016

PREVENTING BACKFLOW IN PIPING CROSS CONNECTIONS,
Watts Regulator Co., Lawrence, Mass.
For primary bibliographic entry see Field 5B.
W75-11018

CORROSION BY DOMESTIC WATERS,
Illinois State Water Survey, Urbana.
T. E. Larson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 723, $4.25 in paper copy, $2.25 in microfiche. Bulletin 59, 1975. 48 p, 32 fig, 2 tab, 38 ref, 3 append.

Descriptors: *Corrosion, *Corrosion control, *Domestic water, Pitting(Corrosion), Pumps, Water wells, Materials, Laboratory tests, Water quality, Water chemistry, Metals, Flow rates, Pipes, Distribution systems, *Water treatment, Chemical reactions, Scaling, Dissolved oxygen, Hydrogen ion concentration, Laminar flow, Turbulent flow.
Identifiers: Tuberculation, Cold water, Hot water, Carrying capacity loss, Calcium carbonate saturation index.

Essential data on corrosion by domestic waters gathered by the Illinois State Water Survey in isolated or programmed studies, and from experience at state institutions since 1950, were summarized. Domestic water was defined as any water provided for human consumption and allied uses, in contrast to sea water, brines, or conventional sewage effluents. Corrosion was defined as the destruction of a metal usually by chemical or electrochemical reaction with its environment. A brief review of basic fundamentals of corrosion was presented as background for the summaries of corrosion data. Also included were some of the general and specific recommendations concerning inhibitors and construction materials that were developed through laboratory and field evaluations for use by architects, engineers, and institutional maintenance personnel. Research needs were indicated. Appendixes contain: (1) a discussion of corrosion in water wells and pumps; (2) a description of the dynamic nature of distribution systems and the problems that can exist; and (3) documentation of actual changes in water quality resulting from microbiological growths to the point of removal of all oxygen, and then further changes under anaerobic conditions in a 6500-foot isolated water line at the end of the system. (Humphreys-ISWS)
W75-11062

SYSTEM FOR SOFTENING AND DEALKALIZING WATER BY ELECTRODIALYSIS,
Vast (J.) Associates, Inc., New York. (assignee)
A. R. Tejeda.
U.S. Patent No 3,893,901, 12 p, 8 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 653, July 8, 1975.

Descriptors: *Patents, *Water treatment, *Water quality control, *Water softening, *Alkaline water, *Electrodialysis, Electrodes, Permselective membranes, Anion exchange, Cation exchange, Separation techniques.
Identifiers: *Dealkalization.

The object is to provide an electrodialytic system which by suitable adjustment of the types of exchange material and permselective membranes employed is capable of either softening or dealkalizing water at a low power consumption and high efficiency. For softening, the water is passed through a cation exchange material placed between a pair of cation permselective membranes. For dealkalizing, the water is passed through an anion exchange material placed between a pair of anion permselective membranes. The ion exchange permselective membranes of like types having ion exchange material of the same type located between them form a chamber in an electrodialytic cell with electrodes at opposite ends of the cell to which a source of direct current is applied. (Sinha-OEIS)
W75-11065

PROCESS FOR RAW WATER CLARIFICATION,
American Cyanamid Co., Stamford, Conn. (assignee)
H. P. Panzer, and K. W. Dixon.
U.S. Patent No. 3,894,945, 7 p, 8 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1007, July 15, 1975.

Descriptors: *Patents, Water quality control, Water pollution control, *Water purification, Suspended solids, Turbidity, Natural streams, Chemical reactions, Water supply, Polymers, Organic compounds, *Water treatment.
Identifiers: *Clarification, *Chemical treatment.

A process is described for clarifying raw water or natural water. The water is treated with an effective amount of a water-dispersible polyquaternary polymer consisting essentially of the reaction product of a lower dialkylamine, a polyfunctional amine, and a difunctional epoxy compound selected from the group consisting of epihalohydrins, diepoxides, precursors of epihalohydrins and diepoxides which under alkaline conditions are readily converted into the corresponding epoxy compounds and mixtures. (Sinha-OEIS)
W75-11072

LOW TEMPERATURE WATER PURIFICATION SYSTEM,
Pollution Control, Inc., South Barre, Vt. (assignee)
G. F. Humiston.
U.S. Patent No. 3,893,894, 9 p, 2 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 651, July 8, 1975.

Descriptors: *Patents, *Water purification, *Water treatment, *Water quality control, Separation techniques, Centrifugation, Evaporation, Distillation, Temperature, Equipment, Heat pumps.
Identifiers: Vacuum evaporation, Vacuum distillation, Low temperature.

A low temperature purification system is provided which is particularly adapted for use to mechanically purify in a continuous operation solutions containing solids and dissolved substances. The purification system includes a solution supply means, and a centrifugal vacuum evaporator to which the solution to be purified is fed from the solution supply. Drive means are operatively connected to the evaporator for subjecting the solution within the evaporator to centrifugal acceleration thereby causing the solids in the solution to be displaced outwardly of the axis of rotation of the solution and the liquid of the solution is displaced inwardly toward the axis of rotation. Outlet means are embodied in the evaporator for discharging the solids. The liquid as it is being displaced inwardly is simultaneously subjected to vacuum distillation to produce vapor. This vapor in turn is condensed to a substantially pure liquid. A heat pump is provided in the system between the centrifugal vacuum evaporator and the condenser means. The heat pump operates to transfer the heat of condensation absorbed by the condenser back to the centrifugal vacuum evaporator to supply heat to the solution in the evaporator to replace the heat loss as the liquid is transformed to vapor. The system includes means for providing heat energy in the solution being introduced to the vacuum evaporator to provide a minimum temperature in the body of the solution within the evaporator and to compensate for heat losses within the system. (Sinha-OEIS)
W75-11074

TOTAL WASTE RECYCLE SYSTEM FOR WATER PURIFICATION PLANT USING ALUM AS PRIMARY COAGULANT,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W75-11094

WATER TREATMENT BY OZONE, (IN JAPANESE),
For primary bibliographic entry see Field 5D.
W75-11107

OPTIMUM VALUES FOR OPERATIONAL VARIABLES IN TURBIDITY REMOVAL,
Mosul Univ. (Iraq).
For primary bibliographic entry see Field 5D.
W75-11110

WATER TREATMENT FOR PUBLIC SUPPLY,
M. A. Hilson.
Chemistry and Industry, Vol 1, p 21-25, January 4, 1975. 1 tab, 2 ref.

Descriptors: *Water treatment, *Potable water, *Water quality control, Water distribution(Applied), Flocculation, Coagulation, Filtration, Sedimentation.

Various Acts of Parliament have put the burden on the supplier of supplying water that 'is free from visible suspended matter, color, odor and taste, and from all objectionable bacteria indicative of the presence of disease producing organisms and contains no dissolved matter of mineral or organic origin which in quality or quantity would render it dangerous to health, and will not dissolve substances from the distribution system which are injurious to health.' Water treatment to obtain such a water falls into 3 stages: bacteriological sterilization; chemical purification to remove objectionable matter; and, quality adjustment to ensure that the water does not pick up any harmful substances during distribution. The processes available to achieve the various stages are presented with emphasis on the processes used by the Fylde Water Board, Great Britain. Chlorine, chlorine dioxide, ozone, or ultraviolet radiation may be used for the sterilization of water. Chemical clarification consists of two stages: flocculation and separation of the solid material formed from the bulk of the water. The first step is achieved by the addition of a controlled dose of a coagulant. The floc formed during coagulation can be made tougher and denser by the addition of polymeric compounds. The removal of the solids from the water can be carried out either in a single stage process by direct filtration or by a two stage process of sedimentation followed by filtration. Water softening can be accomplished by precipitation or by ion exchange. Final quality adjustment is the adjustment of the pH value to a level at which the water will not corrode the pipelines or deposit calcium carbonate in the system. (Orr-FIRL)
W75-11119

CAN A COMPUTER REALLY OPERATE A WATER-FILTRATION PLANT,
Kennedy Engineers, Inc., Tacoma, Wash.
J. Watkins, Jr.
Journal of the American Water Works Association, Vol 67, No 7, p 351-352, July 1975.

Descriptors: *Water treatment, *Filtration, *Treatment facilities, *Operations, *Control, *Computers, Water quality, Flow, Measurement, Monitoring, Simulation analysis, Computer programs, Hydraulics, Industries, Mathematical models, Systems analysis, Chemicals, Evaluation.
Identifiers: Process control, Real-time, Prediction.

In view of today's technology, the ability of the computer to independently perform process control functions on a real-time basis in the operation of a filtration plant is evaluated. To control any function, one must predict the response of the function. Given are the specifications for a mathematical system model to predict, monitor, and control the variables of the process. The Santa Clara District's Rinconada treatment plant is utilized to illustrate a typical filtration plant using a full treatment process (chemicals, coagulation, sedimentation, filtration, and chlorination). In such a plant, control of two processes is necessary: the hydraulic flow of water through the plant and the treatment process itself. The first can be readily calculated and simulated. Two problems, however, make it extremely difficult to develop mathematical control models for the treatment process: (1) water treatment is still partially an art and not completely a science; and (2) There is a lack of good primary instrumentation to measure and control process variables so as to perform control functions on a real-time basis. In conclusion, further development of mathematical equations of the chemical and physical process, process techniques, and equipment and instrumentation are needed before the computer can independently exercise these control functions. Those functions which a computer can perform beneficially in a treatment plant operation, based on Santa Clara experience, are given, and recommendations are made that include enlisting aid of a control systems engineer and selecting an appropriate computer. (Bell-Cornell)
W75-11184

AQUATIC PLANT CONTROL USING HERBICIDES IN A LARGE POTABLE WATER SUPPLY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
For primary bibliographic entry see Field 5G.
W75-11201

ALGAE IN BALTIMORE'S RESERVOIRS,
Baltimore City Dept. of Public Works, Md. Water Supply Treatment and Pumping Div.
For primary bibliographic entry see Field 5C.
W75-11221

ELECTROLYTIC CONTROL OF ALGAE,
Calcutta Metropolitan Development Authority (India).
S. K. Paul, K. V. Chari, and B. Bhattacharyya.
Journal of the American Water Works Association, Vol 67, No 3, p 140-141, 1975. 8 fig, 1 tab.

Descriptors: *Algal control, *Chlorophyta, *Electrolysis, *Water treatment, Electrodes, Settling velocity, Electric currents, Water pollution control.

Algae in water fed to water treatment plants and recirculated effluent from stabilization ponds can be controlled by electrolytic treatment. Experiments were conducted on cultures of planktonic algae (Chlorophyta). Individual organisms were mounted on microscope slides, the current passed momentarily, and the treated cells examined to determine damage and if they were dead. Stained dead organisms did not plasmolyze. Also algae-laden water was passed through a gap between two steel electrodes to avoid toxic effects of copper ions in solution. Maximum voltage was 200 volts, water temperature 26-42C, and the minimum gap between the electrodes was selected to avoid clogging by filamentous organisms. When treated water samples were exposed to diffuse sunlight, photosynthesis was weak or absent, and the green color bleached slowly. Dead algae settled quickly and regrowth did not occur. The lethal action of the electric current may be the result of electrical stress on the organisms, which depends on the potential difference across the cells, maintained by the voltage gradient between electrodes; and diffusion of cellular anions and cations. Both effects are instantaneous and independent of rate of flow between electrodes and concentration of organisms. Current density and voltage are important factors. (Buchanan-Davidson--Wisconsin)
W75-11228

ALGAE CONTROL IN NORTHWEST RESERVOIRS,
Seattle Dept. of Water, Wash.
For primary bibliographic entry see Field 5G.
W75-11231

5G. Water Quality Control

THE RESPONSIBILITY OF U.S. WATER SUPPLIERS,
Senate, Washington, D.C.
E. M. Kennedy.
American Water Works Association Journal, Vol 66, No 10, p 559-562, October 1974.

Descriptors: *Water supply development, *Water quality control, *Water quality standards, Water resources development, Political aspects, Social aspects, Social values, Water pollution, Community development, Governmental interrelations, Legal aspects, Planning, Water reuse, Water demand.
Identifiers: *Water Resources Development Act, *Safe Drinking Water Act.

The problem of providing an adequate supply of water while maintaining and improving the quality of water is discussed. The problem is exacerbated by the increasing demand for water and the public's conception of water as a free and inexhaustible resource. The rising level of pollution in water and the growth of population and industry add new threats to the quality of clean drinking water. The key to the solution is a national water policy implemented under the auspices of federal, state and local governments. The solution will have to be multifold and should include a national commitment to assure an adequate supply of water as is in the Water Resources Development Act. A commitment to end massive pollution and a commitment to support a national policy of conservation are recommended also. (Altuve-Florida)
W75-10856

FACING THE REAL COST OF CLEAN WATER,
Environmental Protection Agency, Washington, D.C.
R. E. Train.
American Water Works Association Journal, Vol 66, No 10, p 562-565, October 1974.

Descriptors: *Legislation, *Water costs, *Legal aspects, *Potable water, Water quality, Public health, Water purification, Cost sharing, Governmental interrelations, Federal government, Chlorine, Water quality standards, Water policy, Water treatment, Government finance, Grants, Government supports, Water values, Research and development.
Identifiers: *Safe Drinking Water Act, Public notification, Legislative history.

The need for federal standards is emphasized, since many of the water systems in this country do not adequately protect their patrons. This is particularly true of the smaller systems which all will have difficulties in meeting water standards. Although there is no drinking water crisis today, there are symptoms of neglect. The passage of the Safe Drinking Water Bill would reduce this neglect because it would require the establishment of national drinking water standards or regulations and would provide federal financial support for the program. The Act is correct in allowing for primarily local or state enforcement and for federal enforcement only if the local government fails to do so. The portion of the Act which calls for public notification concerning environmental matters is significant because a well-informed public is necessary for the maintenance and improvement of quality water systems. (Altuve-Florida)
W75-10857

THE IMPACT OF THE SAFE DRINKING WATER ACT ON UTILITIES,
Boston Metropolitan District Committee, Mass.
J. W. Sears.
American Water Works Association Journal, Vol 66, No 10, p 573-574, October 1974.

Descriptors: *Utilities, *Water quality control, *Water quality standards, *Potable water, *Environmental sanitation, Cost-benefit analysis, Consitiutional law, Administration, Penalties(Legal), Legal aspects, Administrative decisions, Discount rates, Pricing, Water rates, Value, Federal government.
Identifiers: *Safe Drinking Water Act, Liability(Legal aspects).

The Safe Drinking Water Act is a progressive and reasonable piece of social legislation but there are several potentially troublesome aspects of the act. These include the potential cost for compliance, especially the cost to small systems. The application provisions fail to adequately define what systems are controlled by the act and as a result many systems may not be affected by the act although they are the types of systems that the statutory draftsmen of the act probably envisioned. The possibility of erroneously imposed criminal and civil penalties on administrators who are actually not in a position of control is discussed. Water supply administrators should attempt to create a constituency of citizens who understand and follow their efforts. Pricing rates should be reevaluated and nationwide quantity discounts should be eliminated. (Altuve-Florida)
W75-10859

MAN'S INFLUENCE ON THE HYDROLOGICAL CYCLE: A DRAFT REPORT OF THE UNESCO/FAO WORKING GROUP ON THE INTERNATIONAL HYDROLOGICAL DECADE.
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 2A.
W75-10863

AN ANALYSIS OF THE MOTOR-ROW CONVERSION ISSUE OF COLORADO RIVER FLOAT TRIPS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 6B.
W75-10867

OCCURRENCE OF 2, 4, 5-T AND PICLORAM IN SURFACE RUNOFF WATER IN THE BLACKLANDS OF TEXAS,
Agricultural Research Service, College Station, Tex.
For primary bibliographic entry see Field 5B.
W75-10895

CONCURRENT NITRIFICATION-DENITRIFICATION AT THE SEDIMENT-WATER INTERFACE AS A MECHANISM FOR NITROGEN LOSSES FROM LAKES,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W75-10902

INFORMATION AS A REGULATORY TOOL IN WATER QUALITY CONTROL,
Wisconsin Univ., Madison. Land Tenure Center; and Wisconsin Univ., Madison. Dept. of Agricultural Journalism.
H. H. Felstchausen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 502, $3.75 in paper copy, $2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS-WRC 75-06, June 1975. 29 p, 4 fig, 16 ref. OWRT A-055-WIS(1). 14-31-0001-4050.

Descriptors: *Information exchange, *Water law, *Statutes, *Legislation, Legal aspects, *Water permits, Data processing, Documentation, *Wisconsin, Water quality control, Water quality standards, *Federal Water Pollution Control Act.

The Federal Water Pollution Control Amendments of 1972 (Public Law 92-500) were analyzed to test the assumption that a resource well described and well monitored will be well managed. A model was designed of resource legislation which focused attention on: (1) who is being addressed by the law, (2) what actions are to be taken under the law, and (3) what are the defined relationships between actors and objects of action. A content analysis was performed on the 80 sections of the law. In addition, the Wisconsin Pollutant Discharge Permit System was examined. The 1972 Water Pollution Control Act was found primarily to establish an information, monitoring and standards program creating a large data system about water resources and water quality. Of the 80 sections in the law, 75 of them pertained primarily to how the law is to be administered, enforced and reported, not how the water is to be used. This analysis was performed in the context of previous criticism that the regulatory/enforcement procedure will not solve water pollution problems. The study found that an elaborate information system is resulting from the regulatory/enforcement model, but based on the criticism of the model, the vast information system is not to be expected to significantly affect effluent discharges. Several changes are suggested which emphasize technical assistance to the users and information feedback to the pollution dischargers as ways to improve and modify the legislation.
W75-10903

WATER POLLUTION PROBLEMS IN SALISBURY, RHODESIA: PRESENT AND FUTURE,
C. G. Wells.
Water Pollution Control, Vol 74, No 2, p 120-123, 1975. 1 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Water pollution control, Sewerage, Biological treatment, Land management, Irrigation, Water supply, Rivers, Lakes, Treatment facilities, Africa.
Identifiers: *Rhodesia, Chemical treatment, Land application.

Overall water pollution problems in Salisbury, Rhodesia, are presented, as well as proposals for the future. Between 1950 and 1973, there has been a large increase in population, water consumption, and sewage flow, which has strained both financial and natural resources. The region is on a watershed within the catchment area of its water supply, consisting of the Hunyani River and three tributaries and Lake McIlwaine. It was determined that treated sewage effluents are the major cause of pollution. The regional Council decided that the municipality should be responsible for collection, treatment, and disposal of all Salisbury area sewage; treatment will be concentrated at four works with the largest gravity drainage, close to agricultural land; outfall sewers will be constructed draining to the new treatment facilities; schemes for irrigation of land with sewage effluents will be developed; and continued hydrobiological research will be conducted, as well as studies on chemical treatment of sewage. A combination of biological and chemical treatment and irrigation were formulated such that: during the dry season, all flow will be treated biologically, with effluent being applied to land; and, during the wet season, flow will be treated biologically up to the amount to be irrigated or stored, with excess flows to be treated chemically as raw sewage, with treated effluents being discharged to the river. (Prague-FIRL)
W75-10983

WATER CONSERVATION IN SWEDEN: III. CURRENT TRENDS,
Ministry of Agriculture, Stockholm (Sweden).
S. Lundkvist.
Journal Water Pollution Control Federation, Vol 47, No 4, p 673-674, April, 1975.

Descriptors: *Waste water treatment, *Waste disposal, *Water quality, *Oil pollution, *Water conservation, Governments, *Permits, Water pollution control, Potable water, Aquatic life, Oil spills, Lakes, Municipal water, Industrial wastes.
Identifiers: *Sweden.

The Swedish government passed the Environmental Protection Act in 1969, requiring that dischargers of municipal waste water as well as industrial effluents have a permit. Government subsidies of waste water treatment plants seven years ago have led to large-scale construction and increased efficiency. The problems of water management are improving water conditions, stopping further pollution, and repairing present damages. Because 80 percent of Swedish Water consumption is industrial, between 1970 and 1974, 275 million dollars were invested in industrial pollution control, 102.5 million of this as government subsidies. A dramatic decrease in pollution discharge has resulted; for example, BOD has decreased by 520 tons per day. Use of DDT and PCB has also been regulated and curtailed. Oil pollution has been a major water conservation problem. The Swedish Coast Guard, which registers about 250 oil spills per year, has increased its harbor facilities for handling oily wastes and has developed special vessels and depots to deal with the problem. Mercury discharges, which had made fish unfit for human consumption, have been reduced since 1967 from 30 to 40 tons per year to present levels of 800 kg per year. Other marine research has been conducted on water exchange and material balance on lakes, rivers, and groundwater. Lake restoration methods in several areas have used mechanical removal of vegetation and sediments, chemical treatment with flocculants to reduce organic matter and nutrients, oxygenation of bottom waters, and biological methods. Continued environmental protection of Sweden's coastal waters is being provided by agreements with neighboring countries, on its western coastlines and on the Baltic. (Prague-FIRL)
W75-10987

HIERARCHIAL MODEL FOR WATER-SUPPLY-SYSTEM CONTROL,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 4A.
W75-10996

ROLE AND RESPONSIBILITIES OF THE ENVIRONMENTAL PROTECTION SERVICE (CANADA),
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 6G.
W75-11000

OIL SPILL TECHNOLOGY,
Environmental Protection Service, Ottawa (Ontario). Environmental Emergency Branch.
S. L. Ross.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 125-141. 5 fig, 2 tab.

Descriptors: *Water pollution control, *Oil spills, Environmental control, Environmental engineering, Disasters, Oil pollution, Oil wastes, Technology, *Canada.

The Environmental Emergency Branch of Environment Canada was formed to cope with environmental emergencies. To deal effectively with environmental emergencies, the following items must be considered: analysis of the threat; preparedness; and, evaluation of the risk. The state of preparedness is dependent on: the contingency plan which assigns the responsibilities and personnel necessary to reduce the damages due to an emergency; the training of the personnel; and, the availability of proper equipment, techniques and materials. Most of the materials, techniques and equipment currently used are unsatisfactory in terms of their application, labor requirements, sophistication, and/or effectiveness. Research and development requirements in the following areas are representative of the lack of scientific knowledge: diking of storage facilities; detection of spills; containment of spills; recovery of oil and other hazardous materials; and, cleaning and restoration of beaches contaminated with oil. The examples given deal with oil spills but are applicable for other types of environmentally hazardous materials. Guidelines are given for assessing every project for the evaluation and development of new technology. (Orr-FIRL)
W75-11001

WATER RESOURCES,
British Columbia Water Resources Service, Vancouver.
B. E. Marr.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 1-10.

Descriptors: *Planning, *Administration, *Water pollution control, Waste water treatment, Legislation, Water resources, *Canada.
Identifiers: *British Columbia.

The functions and responsibilities of the British Columbia Water Resources Service include water licensing, water investigations (engineering and planning), pollution control, and environmental matters. The pollution control and environmental activities of the Water Resources Service are discussed. A series of public inquiries into each of the major categories of waste discharge in B. C. were held beginning in 1970. Three levels of objectives have been established for most classes of discharge. These objectives will be upgraded or amended to incorporate and reflect changes in technology, economic conditions, and public attitudes. B. C. has developed a discharge permit system. The last five years have seen a good inventory of discharges compiled, objectives set for most types of discharges, and identification of environmental, technical, and administrative problems. A need exists for flexibility in planning--regional, site, resource development, and waste management planning. The structure within the Water Resources Service is being integrated and decentralized. Investigations are being performed to increase the department's expertise in environmental sciences. Waste treatment plant operator training programs are being initiated. (Orr-FIRL)
W75-11003

MILESTONE WATER LEGISLATION ACCOMPANIED BY MILLSTONE OF BUREAUCRATIC RED TAPE,
Hampton Roads Sanitary District, Norfolk, Va.
W. A. Cox.
Professional Engineer, Vol 44, No 10, p 21-23, October 1974.

Descriptors: *Water quality, Planning, *Legislation, *Federal jurisdiction, Effluents, Water pollution control, Treatment facilities, Regulations, Waste water treatment, Participating funds, Costs.
Identifiers: *Public law 92-500.

Since the passing of Public Law 92-500, water quality planning has been improved. However, the processes and steps required to activate a new major waste treatment facility are time-consuming and costly. Uniform effluent limitations to meet 1977 and 1983 treatment method deadlines impose a great deal of pressure on municipalities, especially on their consulting engineers. Applications for funding are processed slowly at the Federal level; Congress has also impounded many of the existing funds. It was recommended that modifications be made either in the law or in the implementation of regulations to ease some of the burden. These include: modification of the time frame constraints; release of impounded funds to stimulate new jobs and manufacturing; reduction of the Federal percentage of participation in funding water pollution control projects; streamlining of the fund distribution process; and, the reinstatement of provisions for reimbursement to municipalities. In addition, it was suggested that more responsibility be delegated to the states, that fund allocation to the states be resumed on a population basis, and that the requirements for user charges be amended to allow localities and regional agencies to employ the types of financial procedures used under state laws and municipal ordinances. Finally, one should establish a continuing review of required treatment standards so that they remain flexible to consider demands of the nation's critical energy supply, operating and capital costs, and effects of treatment on receiving waters. (Prague-FIRL)
W75-11007

COST EVALUATION OF WATERCOURSE MANAGEMENT IN ESSEX,
Cambridge Univ. (England). Dept. of Applied Biology.
M. P. Brooker, and J. H. Baird.
Surveyor Public Authority Technology, No. 4288, p 34-37, August 16, 1974. 2 fig, 2 tab, 2 ref.

Descriptors: *Watercourses(Legal aspects), *Drainage systems, *Herbicides, Environmental effects, *Costs, Odor, Taste, Potable water, Water supply, Public health, Agriculture, Chem control.

In England Wales about 3 million acres of agricultural land are entirely dependent on drainage systems of dykes and larger channels and an additional 2 million acres on wet ditches. The maintenance of good drainage by keeping the watercourses free of vegetation is of national importance. In the past, clearing of the channels has been by 'brushing' or cutting and subsequently removing vegetation from the channel by hand. However, chemical control such as the use of herbicides is becoming a more desired solution to this problem. Detailed records have been kept which allow a direct comparison of the unit costs of chemical applications and conventional hand clearance; the unit cost per annum of herbicide treatment is about 50-75% of the conventional hand clearance, raking and disposal. Other factors than cost are involved in the choice of whether to use chemical control. The most important are the implications of using water containing herbicides for potable and agricultural purposes and the ecological effects of their use. The dosages used in chemical control are unlikely to produce acute toxic effects in man or livestock. One problem involved with using herbicide containing water for public water supply is the presence of tastes and odors. If recommendations for use are followed correctly, herbicides such as 2,4-D and dalapon are unlikely to affect crops irrigated with treated drainage water. The ecological effects on birds by destroying their nesting places and the change in the benthic invertebrates which may in turn cause in fish populations and the effects of chronic doses of herbicides on human and farmstock populations must be evaluated before widespread use of chemical control for watercourse management can be instituted. (Orr-FIRL)
W75-11008

FRESHWATER ECOSYSTEM RESEARCH IN WATER QUALITY MANAGEMENT,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 6G.
W75-11012

YWA PLAN FOR CLEANER RIVERS,
For primary bibliographic entry see Field 5D.
W75-11017

COST SHARING TO HELP CLEAN OUR WATERWAYS.
Dimensions NBS, Vol 58, No 12, p 267-269, December, 1974.

Descriptors: *Costs, *Federal Water Pollution Control Act, *Economics, *Cost sharing, Waste water treatment, Federal government, Municipal water, Industrial water, Treatment facilities.
Identifiers: National Bureau of Standards, Construction Grant Program.

The National Bureau of Standards (NBS) was asked to evaluate the Construction Grant Program by the Environmental Protection Agency, a federal cost-sharing program as defined after the Federal Water Pollution Control Act Amendments of 1972. It was decided by two NBS economists that the cost-sharing is not as efficient or as equitable as it could be. Because the Construction Grant Program provides different levels of Federal funding for different techniques and costs, municipalities may be encouraged to build oversized or inappropriate facilities. The Federal Government subsidizes 75% of the capital costs and cost of land that is needed for the treatment process but does not cover operation or maintenance. Any technology which requires a large operation and maintenance rather than capital costs expenditure will receive little Federal assistance. Distribution of benefits is discussed. Without effective regional cost-sharing management, it may be difficult to apportion costs appropriately between the regional and the federal sectors. Current user fees imposed on industry, households, and businesses for sewage removal and treatment contribute to inefficiency in the selection of techniques and the size of newly developed facilities. The existing program also results in a larger Federal subsidy to industrialized communities than to residential communities. It was suggested, that with optimal cost-sharing, municipalities should choose a scale of abatement that is locally and nationally efficient, and then pay a cost share equal to their marginal benefits. (Prague-FIRL)
W75-11023

USE OF STEELON-NET VEILS FOR PROTECTION OF THE HYDRO-ENGINEERING WORKS AGAINST DREISSENA POLYMORPHIA PALL,
Wyzsza Szkola Rolnicza, Szczecin (Poland). Dept. of Hydrozoology.
L. Szlauer.
Polskie Archiwum Hydrobiologii, Vol 21, No 3-4, p 391-400, 1974. 1 fig, 3 tab, 7 ref.

Descriptors: *Mussels, *Mollusks, *Design, Construction, Engineering structures, *Nets, Environmental effects, Thermal pollution.
Identifiers: *Steelon-Net veils, Hydro-Engineering installations, *Dreissena polymorpha.

Serviceability of the veils used for safeguarding hydro-engineering installations against Dreissena polymorpha invastion has been studied. Mass settling down of young individuals of this mussel species has been observed on the veil hung in the headrace channel furnishing water to the hydro-engineering installation. The veil of 26 m2/in surface was able to withhold 5 million young mussels. The large-scale of the settling of D. polymorpha on the veil allows for the possibility that a range of veils could protect the hydro-engineering installations effectively against the harmful mussels. (Katz)
W75-11033

PRELIMINARY INVESTIGATIONS INTO COPPER CYCLING IN INDIAN LAKE, MASSACHUSETTS: A LAKE TREATED ANNUALLY WITH COPPER SULFATE,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W75-11039

LEGAL AND INSTITUTIONAL PROBLEMS IN THE MANAGEMENT OF SALINITY,
Washington Univ., Seattle. School of Law.
R. W. Johnson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 730, $3.75 in paper copy, $2.25 in microfiche. Completion Report, June 20, 1975. 35 p. OWRT A-076-WASH(1).

Descriptors: *Colorado River basin, Legal aspects, *Institutional constraints, Salinity, Irrigation, Coordination, Management, Water law, Water rights, *Optimum development plans, Federal-State water rights conflicts.
Identifiers: *Salinity control.

This study examines the Colorado River basin salinity management program. The optimal solution will generally be found by considering the problem on a basinwide basis. In most cases the optimal solution is one that would result in the least total cost per unit for the largest salinity reduction. This optimal solution requires extensive voluntary cooperation among all water users; it has proven quite effective in the Colorado River basin. The recommendations for a comprehensive basinwide or regional management entity to plan and implement a salinity control program for the Colorado Basin have, to date, produced a voluntary, cooperative interstate discussion group, the 'Colorado River Basin Salinity Control Forum.' To date all irrigation efficiency and water use management programs have been voluntary and are based on education and persuation rather than on legal regulation. Most water managers and other experts in the Colorado Basin believe the voluntary program will, in the long run, be more effective.
W75-11047

PROCESS STUDIES AND MODELING OF SELF-CLEANING CAPACITY OF MOUNTAIN CREEKS FOR RECREATION PLANNING AND MANAGEMENT,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W75-11055

CORROSION BY DOMESTIC WATERS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5F.
W75-11062

OIL SEPARATOR WITH COALESCING MEDIA,
Amoco Production Co., Tulsa, Okla. (assignee)
L. W. Jones.
U.S. Patent No. 3,893,925, 4 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 660-661, July 8, 1975.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, *Separation techniques, *Oil pollution, Oily water, Sulfur, Coalescence, Pollution abatement, Oil wastes.

A system is described for removing dispersed oil from water by contacting the oily water with sulfur to cause the oil to coalesce or agglomerate. A bed of granular sulfur is provided in a vertical tank through which oily water flows downward. An inverted cone shaped member supports the sulfur. This cone shaped member is perforated to permit the passage of fluid but is also provided with protected channels extending from the base of the cone to an oil gathering chamber at its apex. Oil free water is drawn off at the bottom of the vessel. The oil accumulates in the protected channels and being lighter than water rises to the peak or apex of the cone and is drawn off. The water being heavier than the oil has no tendency to rise but falls downwardly to the bottom of the vessel where it is removed. Both coalescence of the oil droplets and separation of the oil from the water is thus accomplished in a single vessel. (Sinha-OEIS)
W75-11071

COMPARISON OF UREDO EICHHORNIAE, THE WATERHYACINTH RUST, AND UROMYCES PONTEDERIAE,
Florida Univ., Gainesville. Dept. of Plant Pathology.
R. Charudattan, and K. E. Conway.
Mycologia, Vol 67, No 3, p 653-657, May-June 1975 9 fig, 1 tab, 8 ref. OWRT A-027-FLA(6), 14-31-0001-5009.

Descriptors: *Plant pathology, Aquatic plants, *Aquatic weed control, *Biocontrol, *Florida, *Water hyacinth, *Rusts, *Plant diseases, Water pollution control.
Identifiers: Uredo eichorniae, Uromyces pontederiae, Pickerelweed rust.

The waterhyacinth, Eichhornia crassipes (Mart.) Solms (Pontederiaceae), is a troublesome aquatic weed in the tropics and subtropics. In Florida, Several control methods have been tried against it including control with plant pathogens. Among potentially useful pathogens is Uredo eichhorniae Fragoso and Ciferri which may be specific to waterhyacinth. This rust has not been recorded since its original description in 1927, but as a result of surveys in the past 4 yr it was found in the Entre Rios province of Argentina. There have been doubts concerning the propriety of the generic name of this rust. The similarity of Uredo eighhorniae to Uromyces pontederiae Gerard on the related genus Pontederia (pickerelweed) has been suggested. Uromyces pontederiae has been reported from Urguay in its uredial stage on Eichhornia azurea (Swarts) Kunth, the anchoring waterhyacinth. It is uncertain if teliospores are produced on this plant. In surveys in Argentina, the Dominican Republic, Puerto Rico, Uruguay, and Venezuela, no rust was seen on E. azurea. The occurrence of Uredo eichhorniae on E. crassipes in Argentina is reconfirmed, and it is compared with Uromyces pontederiae from localities in Argentina, Uruguay and Florida. The pickerelweed rust was collected from Pontederia cordata L. and P. lanceolata Nutt. Some consider the two as ecotypes of P. cordata. (Morgan-Florida)
W75-11092

GUIDELINES FOR REVEGETATION AND STABILIZATION OF SURFACE MINED AREAS IN THE WESTERN STATES,
Colorado State Univ., Fort Collins. Dept. of Range Science.
For primary bibliographic entry see Field 4D.
W75-11100

A MATHEMATICAL MODEL FOR OPTIMAL WASTE LOAD ALLOCATIONS,
Oklahoma Univ., Norman.
M. S. Masqati.
Available from University Microfilms, Inc., Ann Arbor Mich, 48106. Order No 74-11,251. PhD Thesis, 1974, 189 p.

Descriptors: *Water quality, *Water pollution control, *Mathematical models, River basin development, Streams, Waste water treatment, Planning, Administration, Regional analysis, *Comprehensive planning, Model studies, Oklahoma.
Identifiers: *Waste load allocations, *Verdigris River basin(Okla).

The first and most important step in regional water quality management is river basin planning. One of the most effective methods of water pollution control is treatment of wastes before discharge. Although planners have other alternatives, this method is easily implemented and convenient to administer. In order to maintain a required level of quality in stream waters, waste load allocations

are made to individual waste dischargers on the basis of the assimilative capacities of the streams in the river basin. Stream waters have been analyzed in the past by large complex simulation models requiring a large amount of input data. What planners need is a model that is regional in nature, can work with inadequate data, and requires a minimum of man and computer time. Such a model has been developed and is used to analyze the quality of stream water in the Verdigris River basin. A linear programming model has been developed to make the optimal waste load allocation, thereby minimizing the total cost of waste treatment to a region. (Dean-FIRL)
W75-11102

PROBLEMS OF LIQUID WASTE DISPOSAL,
New South Wales Univ., Kensington (Australia). Dept. of Civil Engineering.
B. W. Gould.
The Institution of Engineers, Australia, Civil Engineering Transactions, Vol CE16, No. 1, p 71-74, 1974. 10 ref.

Descriptors: *Liquid wastes, *Water quality control, *Australia, Effluents, Water pollution control, Biochemical oxygen demand, Turbidity, Eutrophication, Fishkill, Toxicity, Reviews.

A review and discussion of the current problems in liquid waste pollution are given. An increasing need is noted in Australia for controlling effluent discharges, due to industrial expansion as well as growth and density of human populations. The types of pollution described include: oxygen consuming capacity or BOD, which results in fish kills by suffocation; suspended solids, which produce turbidity and reduce penetration of light; pathogenic organisms from enteric human wastes which may spread infections; nutrients which cause eutrophication and upset the ecological balance in waters; toxic materials, especially metals; irritants such as detergents, which are harmful or fatal to fish; dissolved salts, from water used for domestic purposes or irrigation; and carcinogens, mutagens, and teratogens, which may have long term effects. In addition, the aesthetic value of a stream may be destroyed by foam or grease, and discoloration from dyes or floating rubber can lead to undesired odors and tastes. Effluent discharges from both domestic sewage and various industrial wastes are discussed. Solutions to the various problems of liquid wastes in Australia may be found in engineering ability to apply technology to these environmental problems, in political concern and public pressure, and in availability of funds for pollution control facilities. (Prague-FIRL)
W75-11112

DRUG RESISTANT COLIFORMS CALL FOR RE-EVALUATION OF WATER QUALITY STANDARDS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5B.
W75-11130

A NEW LOOK AT POLLUTION PREVENTION ON LOWLAND RIVERS,
Thames Water Authority, London (England).
H. Fish.
Water, No 3, p 2-4, April, 1975.

Descriptors: *Water quality control, *Pollution abatement, *Water supply development, Administration, Chemicals, Water pollution sources, Pesticides, Organic wastes.

It has been shown in recent years that current pollution control practices will not be adequate for the future protection of public supplies drawn from lowland rivers. This reason has prompted the Thames Water Authority to institute a program for the assessment and control of the extent and nature of continuous contamination of lowland water sources with persistent chemicals. Some of the considerations which have led to this conclusion and new approach include: a recent 3 year dry period which resulted in very high increases in the concentration of residual pollutants, especially nitrates, in river water; the discovery of benthal biomethylation of mercury and bioconcentration and biotranslocation of chemical residues; and, the finding of the transfer of minute herbicide residues from rivers into public water supplies. Basically, the new pollution control approach would put the current system into new overall arrangements to determine, in detail and with all possible accuracy, what chemical contaminants are, or may be, passed into lowland water supply rivers, whether these are likely to present any health hazard in public supplies abstracted from the rivers, and to seek removal or reduction to acceptable levels of all contaminants which are, or are likely to be, dangerous. The new approach can be described as 'catchment quality control'. (Orr-FIRL)
W75-11132

HYDROLOGIC INVESTIGATION AND DESIGN OF URBAN STORMWATER DRAINAGE SYSTEMS,
Snowy Mountains Engineering Corp., Canberra (Australia).
For primary bibliographic entry see Field 4A.
W75-11141

CONDENSATION IN JETS, INDUSTRIAL PLUMES AND COOLING TOWER PLUMES,
Waterloo Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 2B.
W75-11166

TREATMENT PLANT MONITORING PROGRAMS: A PRELIMINARY ANALYSIS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W75-11176

THE LOUISIANA ENVIRONMENTAL MANAGEMENT SYSTEM AND ITS UTILITY IN WATER RESOURCE PLANNING,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
C. A. Whitehurst, E. J. Dantin, and D. Harang.
Water Resources Bulletin, Vol 11, No 4, p 734-750, August 1975. 9 fig, 3 tab, 3 ref.

Descriptors: *Water resources development, *Water management(Applied), *Alternative planning, *Multiple-purpose projects, *Decision making, *Data processing, Information retrieval, Computers, Simulation analysis, Assessment, Regional analysis, Mathematical models, Systems analysis, Natural resources, Environment, Ecology, Water quality, *Louisiana, Environmental effects, Water pollution control.
Identifiers: Central processing units, Input-output matrices, Environmental impact.

The Louisiana Environmental Management System (LEMS) is a data processing program developed to aid the Louisiana Joint Legislative Committee on Environmental Quality in decisions leading to resources legislation. Serving as a central data collection and retrieval point for various agencies, the LEMS will maintain assembled information on the location of monitoring stations and coordinate the files of user agencies with data on: land use, air and water quality; meteorological, climatological, and hydrological phenomena; vegetation; fish and wildlife conservation; population; and economics. This data is geographically stored in relation to the state plane coordinate system. For decision making, all pertinent hydrologic, topographic, engineering, cadastral, and other information from separate sources can be automatically mapped as a combined overlay to one of three chosen scales. Land-use patterns are the input data for interative analyses of present conditions and simulated future human activities for assessing the environmental impact of proposed multiple-purpose water resource developments. The assessment methodology requires two complementary functions. The first, general data assessment, determines pertinent data and their parameters, programs the data as input-output matrices, and uses the matrices with algorithms to analyze conditions at a particular site. The second, simulation modeling, provides real and predicted data to assess specific problem areas; hydrodynamic and diffusion simulation programs are included. To demonstrate LEMS, an environmental assessment study in the Tenasas River basin (Louisiana) is considered in terms of its multiple-purpose features. Finally, objectives of the Lower Mississippi River Basin Water Quality Management Plan are considered. (Bell-Cornell)
W75-11177

STRATEGIC APPROACH TO ESTUARINE ENVIRONMENTAL MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-11179

SIMULATION OF WATER QUALITY MANAGEMENT POLICIES,
Virginia State Water Control Board, Richmond.
J. W. Hyden, J. A. Chisman, and H. H. Macaulay.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE4, Paper No 11524, p 623-641, August 1975. 5 fig, 4 tab, 4 equ, 12 ref.

Descriptors: *Water quality control, *Management, *Environmental engineering, *Simulation analysis, Standards, Effluents, River basins, Optimization, Water policy, Economic efficiency, Costs, Waste water treatment, Dissolved oxygen, Systems analysis, Mathematical models, Equations.
Identifiers: *Effluent fees, Feedback, Cost minimization.

A series of water users are located along a river which is the sole source of water intake and the only place in which to discharge wastewater. For a given set of conditions, a management policy such as effluent standard or charge can be set which reflects the basin-wide economic optimum. As these conditions change with time, however, a previously established policy may give rise to a misallocation of allowable waste discharge levels, resulting in a current actual treatment cost greater than that determined to be optimal under the new conditions. Using the prototype computer simulation program written for this study, the actual and optimal solutions are compared. Simulation runs involving three dynamic conditions--user growth, new users, and variable stream-flow--have been made. Misallocations are noted in actual performance relative to optimal solutions. Under an effluent charge policy, resulting treatment cost surpluses and deficits are partially offset by charge deficits and surpluses, respectively. Under a standards policy, there are no charges to offset misallocations. The general simulation program developed for the study has the following capabilities: (1) development of continuous polynomical cost functions based on actual cost data; (2) determination of the optimal solution using the procedure of the Wilde-Beightler algorithm for a nonlinear objective function subject to linear constraints; and (3) comparison of the optimal solution to the actual response, by user acting under a previously established quality management policy. (Bell-Cornell)
W75-11181

OPERATION CLEAN SWEEP,
Army Engineer District, Jacksonville, Fla.
C. F. Zeiger, J. T. McGehee, and J. F. Willis.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 5-13, August 1974. 11 fig.

Descriptors: *Water hyacinth, *Aquatic weed control, *Herbicides, 2-4-D, Environmental effects, Spraying, *Florida, Costs, Water pollution control.
Identifiers: St. Johns River(Fla), Lake George(Fla).

An effort was made to catch and spray the water hyacinths in the St. Johns River from Palatka to Jacksonville, Florida in their early growth stage, since they had been damaged by frost, and to bring the number of plants to manageable proportions before the heavy summar growing season. The long range objective was to reduce the water hyacinth problem to a routine maintenance proportion. A residual shoreline fringe had been left in 1971, but during the mild winter of 1972 the plants flourished. Spraying controlled the Lake George area but large free-floating mats had moved downstream, shifting with the wind, blocking navigation, damaging crab traps, endangering piers, and reducing the amount of dissolved oxygen in the water by the heavy concentrations of the floating plants. During the spring of 1973, the control program had reduced the water hyacinth problem to a routine maintenance situation which required only one airboat to cover the area. The intensified control operation required 50 days to spray 3026 acres with 2,4-D amine at an estimated cost of $37,000 or $12.23 per acre. Despite the concentrated spraying there was a heavy population of young bass, possibly due to the cool weather and the vegetation. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11192

FIELD TESTS OF SLOW-RELEASE HERBICIDES,
Army Engineer District, New Orleans, La.
W. E. Thompson.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 15-20, August 1974. 6 fig.

Descriptors: *Aquatic weed control, *2-4-D, *Herbicides, *Application methods, *Louisiana, Rubber, Floating plants, Water hyacinth, Submerged plants, Rates of application, Water pollution control.
Identifiers: Slow-release formulations, Water milfoil, New Orleans(La).

Slow-release formulations of the butoxyethanol ester of 2,4-dichlorophenoxyacetic acid (2,4-D) dissolved in natural rubber were developed to treat aquatic vegetation only in specific zones, such as at the water surface or rooted plants at or near the mud-line, eliminating the need for total water column treatment and reducing the amount of chemical applied, frequency of application, and total cost. Three tests were made in the New Orleans area. In a field test of a rubber-herbicide combination with a specific gravity greater than one, surface air bubbles prevented the particles from sinking rapidly enough, causing part of the root to be undertreated and the rest overtreated. This herbicide was not very effective against Brazilian elodia, hornwart or fanwart and even an effective herbicide would not have reached toxic concentrations under the test conditions. Rubber-herbicide suspender strips satisfactorily controlled water hyacinths. Plant bending occurred for a longer time than with foliar treatment but the plants were eliminated in about seven months, and the ditch remained clear of hyacinths. Rubber-herbicide sinkers applied to Eurasian water milfoil sank when broadcast but were light enough to remain on the plant leaves. Discoloration of the plants was observed in two weeks and vegetation was eliminated in four months. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11193

AQUATIC PLANT CONTROL ON LAKE CORPUS CHRISTI,
Army Engineer District, Galveston, Tex.
C. J. Novosad.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 21-23, August 1974.

Descriptors: *Aquatic weed control, *Herbicides, *Water hyacinth, Alligator weed, *Texas, Application methods, Rates of application, Spraying, Costs, Floating plants, Operating costs, Maintenance costs, Annual benefits, Cost-benefit ratio, *2-4-D.
Identifiers: *Lake Corpus Christi(Tex), 2-4-D BEE.

Since control of water hyacinths in Lake Corpus Christi, Texas was begun in March 1970, about 17,000 acres have been treated. Most spraying operations were from small boats using 2,4-D butoxyethanol ester at a rate of 2 to 4 lbs/acre active acid equivalent. Aerial spraying was also used with increased dosages. Some areas could not be reached by boats or aircraft thus it was necessary to spray using long hoses from boats or land-based trucks. At the date of the report the lake was essentially free of hyacinth infestations and required only a small amount of maintenance spraying to control seedlings. The estimated total first cost for the plant control and eradication program was $724,700 with an estimated annual charge of $24,550 based on 3-1/4% interest rate for amortization and a project life of 100 years. The annual charges totaled $29,050 which included $4,500 for operation and maintenance. The annual benefits for eradication of water hyacinth and alligator weed in ten work areas (Nueces, Guadalupe, Sabine, Trinity, Neches, San Jacinto, and Rio Grande River Basins; Cypress Creek Basin; and north and south coastal areas) were estimated at $194,040. The benefit-cost ratio was 6.7. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11194

AQUATIC PLANT RESEARCH AND CONTROL IN FLORIDA,
Florida Dept. of Natural Resources, Tallahassee.
For primary bibliographic entry see Field 4A.
W75-11195

CRITERIA FOR HERBICIDE EVALUATION,
Environmental Protection Agency, Washington, D.C. Office of Pesticide Programs.
T. D. Burkhalter.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 29-31, August 1974.

Descriptors: *Aquatic weed control, *Specifications, *Regulation, *Legislation, Standards, Herbicides, Pesticides, Water quality standards.
Identifiers: *Pesticide registration.

The Criteria and Evaluation Division of the Pesticide Program of the Environmental Protection Agency is responsible for the development of guidelines for the registration of pesticides. The authority for the regulation of pesticides is found in the Federal Insecticide, Fungicide, and Rodenticide Act, which specifies the administering agency and delegates to that agency the authority to establish regulations to accomplish its provisions. Regulations generally deal with one provision of an Act, presenting policies and procedures necessary to effectively administer that provision. To clarify the requirements of the Act and the penalties for not adhering to them, Congress required that guidelines be published, specifying the kinds of information required to support the registration of a pesticide. Guidelines were prepared to interpret the Act, to detail requirements and suggestions, interrelate information, and answer questions. The guidelines include an appendix of conversion tables and required and suggested methods and procedures. Data will be presented in sections indicating various disciplines in three categories: required, suggested, and tentative. To deal with special problems involved with aquatic pesticide use, Budget Issue Papers are prepared to delineate the problems and recognize the needs for acceptable vocabulary, definitions, testing, and evaluation methods. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11196

REGISTRATION OF HERBICIDES FOR AQUATIC USE,
Environmental Protection Agency, Washington, D.C. Office of Pesticide Programs.
R. J. Hummel, and J. C. Cummings.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 33-36, August 1974.

Descriptors: *Pesticide residues, *Toxicity, Standards, *Herbicides, Aquatic weed control, Lotic environment, Lentic environment, Estuaries, Safety, Regulation, Potable water, 2-4-D, Crops, 2-4-5-T, *Water quality standards.
Identifiers: *Herbicide registration.

Toxicology data, including 90-day feeding for two species of mammals, and residue data for irrigated crops, meat, poultry, milk, eggs, fish, shellfish, and potable water are required for registration of each aquatic herbicide. Separate protocols will probably be necessary for still waters, flowing waters, and tidal estuaries because of divergent environmental conditions. If herbicide residues are expected, toxicology data must be furnished to support safety of the residues. Residue clearance for USDA registration can be obtained by requesting the USDA to register it as a nonfood use or petition for an FDA regulation setting a tolerance or exemption from requirement of a tolerance. A nonfood use involves application remote from food crops where there is no reasonable expectancy of residues; this may include some aquatic uses. If used for irrigation, residue data must support the use; water should be monitored downstream and if residues are indicated, crop analysis should be made to determine residue tolerances. A March 1968 Public Health Service bulletin updated drinking water standards to include 2,4-D, 2,4,5-T, and 2,4,5,-TP and presented guidelines for water control authorities. Legislative jurisdiction for pesticide tolerance in potable water was unresolved. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11197

DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED FOR WATER MILFOIL CONTROL IN LARGE RESERVOIRS,
Tennessee Valley Authority, Muscle Shoals, Ala.
For primary bibliographic entry see Field 5B.
W75-11198

CHEMICAL CONTROL OF EGERIA DENSA,
Agricultural Research Service, Fort Lauderdale, Fla.
R. D. Blackburn.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways

Experiment Station, Vicksburg, Mississippi, p 43-51, August 1974. 3 tab, 11 ref.

Descriptors: *Submerged plants, *Herbicides, *Aquatic weed control, *Chemcontrol, Diquat, 2-6-Dichlobenil, Copper, Application methods, Toxicity, Fish, Rates of application, Taxonomy.
Identifiers: *Egeria densa, Brazilian elodea, Endothall.

The taxonomic features of Egeria densa are described. The effects of several commonly used herbicides on Egeria were studied. In the laboratory endothall (amine salt) was more effective than potassium and dihydroxy aluminum salts. Addition of copper to endothall increased the effectiveness of both herbicides. Diquat alone or with a copper amine complex was very effective. Water temperature during application may be important. Diquat gave good control in growth pools. Addition of endothall or copper to diquat had no advantage. Endothall (amine salt) was effective on Egeria but toxic to fish. Endothall (potassium and dihydroxy aluminum salts) were safe for fish but did not control Egeria. Copper plus endothall increased the effectiveness of both. Copper partially controlled Egeria, was toxic to fish, and regrowth was rapid. In field trials, diquat partially controlled Egeria; the diquat-copper complex gave excellent control; but potassium endothall plus diquat did not increase activity. Endothall (amine salt) was the most effective and endothall (TD-1874) more effective than the aluminum and potassium salts. An endothall controlled-release formulation was more effective on Egeria and less toxic to fish than regular formulations. Dichlobenil did not control Egeria but delayed regrowth when applied after diquat. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11199

FIELD TESTING OF AQUATIC HERBICIDES FOR CONTROL OF EGERIA DENSA,
University of Southwestern Louisiana, Lafayette. Dept. of Plant Industry.
J. R. Barry.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 53-60, August 1974. 4 tab.

Descriptors: *Aquatic weed control, *Herbicides, *Laboratory tests, *On-site investigations, Diquat, Rates of application, Water temperature.
Identifiers: Egeria densa, Brazilian elodea, Black Lake(La), Lake Martin(La), K-lox, Fenac, 3M System E, TD-1874, TD-1929, SD-16389, Compound K, Triazine, Florida elodea, Hydrilla verticillata.

Field testing of promising herbicides during previous tests was conducted in Lake Martin near Lafayette, Louisiana. In one test diquat and diquat in a tank mix including copper hydroxide triethanolamine complex (K-lox) were most active in the control of Egeria densa, followed by endothall derivatives TD-1874 and TD-1929. K-lox gave less protection than when mixed with diquat. Fenac gave poor results which were inconsistent with prior pool and field studies. The 3M System E formulation was of no practical value for Egeria control. In another test an experimental copper complex formulation containing 8% copper (Compound K) was cost effective against Egeria, followed by diquat + K-lox, diquat + compound K, K-lox, and diquat. Effective control of Egeria in field tests could thus be achieved with at least two herbicides. SD-16389, an experimental triazine, received the lowest rating, which was inconsistent with pool studies, perhaps due to dilution factors. Further testing of SD-16389 will be conducted under field conditions to determine if effective rates and/or application techniques may be developed to provide the control shown in pool tests. A new invasion of Hydrilla verticillata in Louisiana was discovered on July 1973 in Spanish Lake near New Iberia. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11200

AQUATIC PLANT CONTROL USING HERBICIDES IN A LARGE POTABLE WATER SUPPLY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
C. B. Schreck, C. R. Berry, R. J. Strange, S. L. Van Horn, and R. V. Corning.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 61-70, August 1974. 5 fig.

Descriptors: *Impoundments, *Potable water, *Aquatic weed control, *Herbicides, Diquat, *Virginia, Comparative productivity, Fish, Rates of application, Dispersion, Application methods, Pesticide residues, Bottom sediments, Reservoirs, Oxygen.
Identifiers: *Chickahominy Reservoir(Va), *Walker's Dam Impoundment(Va), Newport News(Va), Coontail, Duckweed, Egeria densa, Brazilian elodea, Potassium endothall, Lyngbya, Ceratophyllum.

In July 1973, flowing water and still water quadrants of Chickahominy Reservoir (Walker's Dam Impoundment) in Virginia, a potable water supply for Newport News, were treated with diquat dibromide and potassium endothall to control Brazilian elodea (Egeria densa). The effects on biological, chemical, and physical parameters of the ecosystem; extent of weed eradication; and herbicide physical and biological behavior were investigated. Rhodamine B indicated limited water movement. Nitrates, nitrites, pH, total phosphates, orthophosphates, calcium, magnesium, hardness and alkalinity did not change, but oxygen concentration increased steadily in weeded areas. Light extinction decreased. Phytoplankton primary productivity was immediately depressed, then increased steadily. Fish were not killed or eliminated. Closing the reservoir to human consumptive uses for 14 days was enough for the chemicals to dissipate. Herbicide concentrations and chemical oxygen demands in Egeria, coontail, duckweed, algae, bluegills, golden shiners, bass, and hydrosoils were being determined and dynamics of uptake and decline in water, plants, and sediment simulated. Visual observations and aerial photographs were made of plant dieoff. Duckweed surface elimination was an index of Egeria eradication. Egeria and coontail declined but algae increased following treatment. The treatment was successful and acute detrimental environmental impacts were not evident. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11201

BIOLOGICAL CONTROL OF ALLIGATOR WEED, 1959-1972,
Agricultural Research Service, Beltsville, Md.
J. R. Coulson.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 71-74, August 1974.

Descriptors: *Aquatic weed control, *Biocontrol, *Alligatorweed, Insects, *South Carolina, Overwintering sites, Reservoirs, Plant populations, Succession.
Identifiers: *Agasicles hygrophila, Columbia(SC), Jim Woodruff Reservoir(SC), Eurasian water milfoil, Giant cutgrass, Hydrilla, Limnophylla.

The biological control of alligatorweed by Agasicles hygrophila was evaluated. Agasicles can overwinter as far north as Columbia, South Carolina and seems to be capable of reducing alligatorweed to a lesser economic or noxious role in the environment. There are insecticides which can control but not eradicate Agasicles; however this will probably never be necessary as its populations will probably vary with the food supply. At the Jim Woodruff Reservoir treatment of alligator weed caused water hyacinths, Eurasian water milfoil, Hydrilla, Limnophylla, catails, and giant cutgrass to increase. Thus a modification in the aquatic ecosystem tended toward increased diversity in the plant community but little improvement in the balance between producer and consumer organisms because of the pest potential of the invading plant species. In an ecosystem with several introduced weeds competing for space but without a complex of natural enemies, control efforts toward one species, if successful, can mean expansion of one or more of the others. A total pest management program for aquatic weeds is needed. Resources currently available for biological control of weeds limit this approach. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11202

BIOLOGICAL CONTROL OF EURASIAN WATER MILFOIL,
Agricultural Research Service, Gainesville, Fla. Biological Control Lab.
For primary bibliographic entry see Field 4A.
W75-11203

INTEGRATED CONTROLS ON NOXIOUS AQUATIC PLANTS,
Texas Parks and Wildlife Dept., San Antonio. Statewide Noxious Vegetation Control Program.
L. V. Guerra.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 85-87, August 1974.

Descriptors: *Integrated control methods, *Aquatic weed control, Biocontrol, Insects, Alligatorweed, Overwintering sites, Water hyacinth, 2-4-D, Floating plants, Submerged plants, Chemcontrol, Copper sulfate, Mechanical control, *Texas, Harvesting, Succession, Chara, Application methods, Rates of application.
Identifiers: Eurasian water milfoil, Coontail, Egeria, Elodea, Flea beetles, Water hyacinth weevils, Cabomba, Water lilies, Bladderwort, 2-4-D BEE, Aqua Kleen 20.

The program of integrated control of noxious aquatic plants in Texas involves chemical and biological methods. Mechanical methods proved to be expensive; use of the fiber, protein, and residue as chicken feed was unfeasible; plants grew back in 43 days, and harvested plants were replaced by hardier, more chemically resistant plants. Flea beetles have been used on alligatorweed and water hyacinth weevils on water hyacinths. Establishment of permanent brood stock colonies of these insects near Brownsville and possibly San Marcos are planned. Dramatic results have been obtained with chemicals in Caddo Lake in northeast Texas where the main boat roads were blocked by white and yellow water lilies, milfoil, bladderwort, coontail, cabomba, and elodea. Granulated 2,4-dichlorophenoxy acetic acid butoxyethanol ester (2,4-D BEE) was effective against broad leaf plants, but egeria, chara, and cabomba had a natural partial resistance. Treatment of these plants under phytotoxic stress with copper sulfate gave excellent results. A second application of 2,4-D BEE was necessary in areas subject to flooding, high turbidity, and a flushing effect from high currents; the gradual decomposition of the plants and nutrient release improved fishing. Five watersheds are now under a minimal maintenance program, and work is progressing on others. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11204

UNISEX STUDIES ON THE WHITE AMUR,
Bureau of Sport Fisheries and Wildlife, Stuttgart, Ark. Fish Farming Experiment Station.
For primary bibliographic entry see Field 5C.
W75-11205

UTILIZATION OF PHYTOPATHOGENS AS BIOCONTROLS FOR AQUATIC WEEDS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
T. E. Freeman, F. W. Zettler, and R. Charudattan.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 97-102, August 1974. 12 ref.

Descriptors: *Biocontrol, *Aquatic weed control, *Plant diseases, Water hyacinth, Alligatorweed, Southeast United States, Florida, Blights, Rots, Spots, Hosts, Plant pathology, Viruses, Subtropic.
Identifiers: *Rhizoctonia solani, *Sepholosporium zonatum, Eurasian water milfoil, Hydrilla, Phthium, Sclerotium, Penicillium.

The progress of research at the University of Florida in the study of plant diseases for the biological control of noxious aquatic plants, especially water hyacinth, Hydrilla, alligatorweed, and Eurasian water milfoil is described. Because many of these plants are not native to the United States, disease surveys were made in much of southeastern United States, the Caribbean Islands, South and Central America, and India. Several diseases have been found to affect water hyacinth. Of the leafspots, Cephalosporium zonatum has the highest potential. Indian workers believed Alternaria eichhorniae had potential, but Florida isolates were not aggressive pathogens; Indian isolates are being studied. Three general blights have also been studied; Rhizoctonia solani is especially promising despite its wide host range. A severe root and crown rot was discovered which may be caused by a complex of organisms. The five diseases against Hydrilla were the first ever recorded, and their potential is being assessed. A stunt disease of alligatorweed caused by a virus that may belong to the beet-yellows group has been found, but transmission of the causal agent has been difficult. Certain isolates of R. solani will also affect Hydrilla and alligatorweed. No disease for Eurasian water milfoil has yet been isolated. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11206

TRANSPLANTING SEA GRASS IN MISSISSIPPI SOUND,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 4A.
W75-11207

CO2 LASER EFFECTS ON WATER HYACINTH,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. G. Collins.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 111-118, August 1974. 7 fig.

Descriptors: *Aquatic weed control, *Irradiation, *Water hyacinth, Radiation, *Louisiana, Water pollution control.
Identifiers: *Laser, *Carbon dioxide laser, Bayou Gauche(La), Lake Concordia(La).

The objective in Bayou Gauche near New Orleans was to determine how the laser system would function in an outdoor environment. There was damage from the irradiation, but no strong correlation between degree of damage and irradiation level. In Lake Concordia, Louisiana, the objective was to establish the effects of carbon dioxide laser radiation on water hyacinths. Biomass decreased with increased irradiation but little additional damage occurred above a level of 30-40 joules/sq cm. Irradiation may have a prolonged effect since the biomass decreased progressively as a function of time following irradiation. During the first two weeks after irradiation there was no effect on propagation rates, but then there was a decrease in propagation rates with an increase in irradiation and time. There was no evidence of actual plant kill. Coverage of plot areas appeared to decrease with an increase in irradiation and time following irradiation. A cost-effectiveness evaluation of the laser as a control device is needed. Tests should be conducted at the beginning and during the height of the growing season on plants with a wider size range using radiation levels below 30 joules/sq cm. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11209

OPERATIONS PLATFORMS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W75-11210

HERBICIDE CHEMICALS AND THEIR EFFECT ON THE AQUATIC ENVIRONMENT,
Bureau of Sport Fisheries and Wildlife, Washington, D.C. Div. of Fishery Research.
For primary bibliographic entry see Field 5C.
W75-11211

REGISTRATION OF AQUATIC HERBICIDES,
Office of the Chief of Engineers (Army), Washington, D.C.
For primary bibliographic entry see Field 4A.
W75-11212

DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED TO THE WATERSHED,
Oregon State Univ., Corvallis. School of Forestry.
For primary bibliographic entry see Field 5B.
W75-11213

DISSIPATION OF PHENOXY HERBICIDES APPLIED TO RIPARIAN VEGETATION,
Pennsylvania State Univ., University Park. School of Forestry.
For primary bibliographic entry see Field 5B.
W75-11214

WATER HYACINTH RESEARCH IN PUERTO RICO,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. N. Rushing.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p F3-F24, August 1974. 3 fig, 7 tab.

Descriptors: *Water hyacinth, *Puerto Rice, *Aquatic weed control, *Biocontrol, Growth rates, Snails, Productivity, Biomass, Research and development.
Identifiers: *Brazilian snails, Pomacea australis, Water lettuce.

Water hyacinths are the most troublesome aquatic weed in Puerto Rico. Hyacinth reproduction rate at three different natural sites varied from 0.9 to 8.6 plants per day (48.3 to 587.4 g/day) but the rate of production of daughter plants at all three sites rose to a maximum during a 15 to 40 day period then declined. Sometime within that period, plant material covered the water surface, suggesting that crowding inhibited production of daughter plants. Only water pH varied between plots. Disturbing the plants had some effect on productivity, but the extent was not determined. In laboratory tests, productivity of plants from the three areas varied in tap water, but was the same when fertilized. When hyacinth and Brazilian snails (Pomacea australis) were placed in tanks together, the mass of hyacinths decreased while the mass and number of snails increased, although their individual weights remained approximately the same. Snails consumed water lettuce faster than hyacinths. When both were present, snails consumed the lettuce first, then rapidly consumed the hyacinths. The snails eat a variety of green plant material, thus are not specific to hyacinths. The snails offer a promising potential for water hyacinth control. (See also W75-08289) (Buchanan-Davidson--Wisconsin)
W75-11215

WATER LEVEL MANIPULATION: A TOOL FOR AQUATIC WEED CONTROL,
Louisiana Wild Life and Fisheries Commission, Tioga. Aquatic Weed Research.
For primary bibliographic entry see Field 4A.
W75-11216

THE AQUATIC WEED PROBLEM. 1. IDENTIFICATION,
Victoria State Coll., Carlton (Australia). Dept. of Plant Physiology.
For primary bibliographic entry see Field 2I.
W75-11220

ELECTROLYTIC CONTROL OF ALGAE,
Calcutta Metropolitan Development Authority (India).
For primary bibliographic entry see Field 5F.
W75-11228

ALGAE CONTROL IN NORTHWEST RESERVOIRS,
Seattle Dept. of Water, Wash.
J. E. Courchene, and J. D. Chapman.
Journal of the American Water Works Association, Vol 6, No 3, p 127-130, 1975. 3 fig, 3 ref.

Descriptors: *Algal control, *Pacific Northwest US, *Reservoirs, Application methods, Rates of application, Water storage, Potable water, Algicides, Copper sulfate, Chlorine, Chlorination, Safety factors, Hazards, Fish.
Identifiers: Storage reservoirs, Distribution reservoirs, Light exclusion.

Several methods of nuisance algae control in Pacific Northwest water supply reservoirs are described. Knowledge of the proper algicide to use, when, how much, and how to apply it, and of the water to be treated is essential. Copper sulfate was found to be the most satisfactory algicide. Factors influencing the amount of copper sulfate to be used, susceptibility of organisms, and effects of its usage are discussed. Chlorine may be used in conjunction with copper sulfate. The rates and methods of application are determined by reservoir size, available equipment, and cost. Rapid dissolution and uniform application are essential. Workers should avoid accidental ingestion or inhalation. New reservoirs should be cleared of vegetation and organic matter to eliminate nutrients for algal growth. Preferably distribution reservoirs should be covered to exclude sunlight to prevent proliferation of algae. Use of gas chlorination is cheaper than copper sulfate or hypochlorites. With a continuous program of sampling, identification, and treatment, water supplies should remain clean and palatable. (Buchanan-Davidson-Wisconsin)
W75-11231

INSTITUTIONAL ARRANGEMENTS FOR REDUCING CONFLICT OVER WATER QUALITY IN INTERNATIONAL RIVERS,
Arizona Univ., Tucson. Inst. of Government Research.
For primary bibliographic entry see Field 6E.
W75-11242

TRANSLATIONS ON ENVIRONMENTAL QUALITY, NO. 33.
Joint Publications Research Service, Arlington, Va.
Report JPRS 62033, May 20, 1974. 36 p.

Descriptors: *Foreign countries, *Pollution abatement, *Pollutants, *Water pollution control, Water pollution sources, Environmental effects, Potable water, Water supply development, Foreign waters, Insecticides, Mexico, DDT, Industrial wastes, Air pollution, Water treatment, Recycling.
Identifiers: *Brazil, *USSR, *West Germany, Coatzacoalco River(Mexico), Caspian Sea, Vazuza River(USSR), Moscow(USSR), Volga River(USSR), Ural River(USSR).

Translations of newspaper articles and press commentary on environmental pollution and its effects, and pollution control technology, organizations, and programs are presented. The 13 articles and 3 news briefs included originate from Brazil, Mexico, the USSR, and West Germany during the period from October 1973 - May 1974. Topics include concern over the harmful effects of DDT in Brazil; various industries accused of polluting the Coatzacoalco River, Mexico; praise of the Volkswagen de Mexico for its efforts in the field of environmental pollution control; a plan to control the evaporation of the Caspian Sea; intentions to tap the Vazuza River in order to increase drinking water supplies for Moscow; and the elimination by 1980 of industrial pollution of the Volga and Ural basins by Soviet technology. Other articles from the USSR discuss principles of classifying documents on nature conservation and natural resources; the improvement of the Krasnovodsk Oil Refinery waste treatment facilities and of the purity indicators at the Kalinin aeration station; the establishment of a commission on the protection of nature; and air and water purification methods for the steel industry. The West German article summarizes a series of tests of ideas for combating environmental pollution. (Becker-Wisconsin)
W75-11246

AN ECONOMIC ANALYSIS OF THE POLLUTION PROBLEMS IN THE COLORADO RIVER BASIN: THE UPPER MAIN STEM SUB-BASIN,
Colorado Univ., Boulder.
C. W. Howe, J. F. Kreider, and B. Udis.
Available from the National Technical Information Service, Springfield, Va. 22161, as COM-74-11311, $8.50 in paper copy, $2.25 in microfiche. Report No EDA-OER-74-308, October 1972. 238 p, 25 fig, 38 tab, 60 ref, 2 append. OER-351-G-71-8.

Descriptors: *Industrial production, *Environmental effects, *Colorado River Basin, *Regional development, *Input-output analysis, *Computer models, Salinity, Air pollution, River basins, Colorado, Colorado River, Rocky Mountain Region, Computer programs, Planning, Oil shales, Recreation, Industries, Agriculture, Water transfer, Utah, Mining, Livestock, Human population, Employment, Lumbering, Powerplants, Projections, Hydrologic aspects, Groundwater, Water supply.
Identifiers: FORTRAN models, Upper-Colorado River sub-basins, Eastern Rocky Mountains.

To permit planners to test some environmental implication of alternative growth patterns for the Upper Main Stem sub-basin of the Colorado River, a set of models relating economic activities to air and water demand and quality are developed. This interim report describes a model which has three components: (1) an input-output model of the sub-basin economy, (2) an air diffusion model projecting the airborne distribution of residuals over the region, and (3) a hydrologic-salinity model to trace the monthly surface and groundwater flows and salt flows through the system. Included in the analysis are the agriculture, forestry, mining, energy, manufacturing, tertiary industries, and contract construction aspects of the economy. FORTRAN computer programs for hydro-salinity, residuals generation and pollutant dispersion aid in modeling the relationships between economic activities and environmental implications. The hydro-salinity model has an economic buffer which computes water withdrawal demands, consumptive uses and waste loads, and inputs these data into the combined hydro-salinity model. The Air Pollution Generation and Dispersion Model (APGDM) program computes air-borne residuals generation rates and ground-level pollutant patterns, corresponding to the level of economic activity determined by field surveys or by projections of the input-output model. Use conflicts can be identified through such sets of models. (See also W75-07377) (Becker-Wisconsin)
W75-11247

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: MEAT PACKING INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
R. E. Seltzer, and J. K. Allwood.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-235 303, $6.25 in paper copy, $2.25 in microfiche. Report No EPA-230/2-74-017, May 1974. 164 p, 13 fig, 49 tab. 68-01-1533.

Descriptors: *Food processing industry, *Effluents, *Economic impact, *Water pollution control, *Pollution abatement, Pricing, Waste water treatment, Costs, Foreign trade, Social impact, Investment, Water quality standards, Profit, Employment, Facilities, Industrial wastes.
Identifiers: *Meat packing industry, *Effluent guidelines.

The economic impact of effluent guidelines is assessed for meat packing houses and for slaughterhouses according to size and characteristics. The meat packing and slaughtering industry is characterized by high dollar sales volume and low sales dollar earnings--the after tax earnings in 1972 were 0.8% on sales. Increased costs associated with the implementation of effluent guidelines must be (1) absorbed by meat packers, (2) passed forward to consumers as higher meat prices, (3) passed backwards to suppliers as lower prices for livestock, or (4) some combination of these options; margins in the industry are narrow, so presumably cost increases associated with effluent controls will be passed on primarily as higher retail meat prices. The economic impact analysis, utilizing data developed on industry segments, financial profiles, price effects, and pollution abatement technology and costs, includes effects on pricing, financing, production, employment, community and foreign trade. Plants discharging into municipal sewers will be unaffected by these guidelines. For all other plants, price increases required to meet 1983 standards would be 0.3-0.4% for large, 0.4-0.7% for medium and 1.1-1.25% for small. Plant closures would be greatest among small plants and would affect slaughter-only plants more than meat packers. (Becker-Wisconsin)
W75-11249

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES, FERROALLOYS INDUSTRY.
Kearney (A. T.) and Co., Inc., Chicago, Ill.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-234 045, $5.25 in paper copy, $2.25 in microfiche. Report No EPA-230/2-74-009, June 1974. 131 p, 6 fig, 48 tab. 68-01-1545.

Descriptors: *Air pollution, *Effluents, *Water pollution control, *Economic impact, *Iron alloys, *Pollution abatement, *Industrial wastes, Water quality standards, Steel, Waste water treatment, Investment, Operating costs, Social impact, Pricing, Facilities, Foreign trade, Costs, Cooling towers, Profit.
Identifiers: *Ferroalloys industry, *Effluent guidelines.

Based on the analyzed data and interviews with ferroalloy manufacturers, it is believed that the proposed water pollution control standards (1983 standards--Best Practicable Technology) will have no significant effect on production levels or plant closings in the ferroalloy industry. The analysis of the manufacturing of the four major ferroalloys--ferromanganese, ferrosilicon, ferrochromium, and silico-manganese--includes nine companies, operating 22 plants. To assess the impact of proposed effluent guidelines the following measures were made: (1) the financial impact on the industry as a whole according to several indices, (2) the same analyses on groups of companies, and (3) the impact on prices of ferroalloys based on the maintenance of the industry's historical average level of profitability before taxes. It was found that 14 of the 22 plants already have in operation the equipment necessary to meet 1977 standards and will require only a small investment to meet 1983 standards. For the eight plants needing additional water pollution abatement equipment, a price increase of 1.0-1.3% for 1977 standards and 2.2-2.4% for 1983 standards is necessary to maintain the industry current return on total assets. Other considerations in the future of the ferroalloys industry include air pollution control costs and foreign competition. (Becker-Wisconsin)
W75-11250

THE WATER INDUSTRY IN TRANSITION,
National Water Council, London (England).
For primary bibliographic entry see Field 3E.
W75-11252

THE ECONOMIC IMPACT OF POLLUTION ABATEMENT: THE CASE OF WATER POLLUTION BY DEGRADABLE ORGANIC MATTER,
Centraal Planbureau, The Hague (Netherlands).
H. den Hartog.
Occasional Papers No 1, 1973. 71 p, 7 tab, 3 append.

Descriptors: *Economic impact, *Pollution abatement, *Organic matter, *Eutrophication, *Input-output analysis, Decomposing organic matter, Water pollution control, Legislation, Europe, Mathematical models, Financing, Gross National Product, Employment, Pollution taxes(Charges), Water quality, Foreign trade.
Identifiers: *Netherlands.

A measurement of the economic consequences of the abatement of water pollution, specifically by degradable organic matter, using direct and indirect policy instruments and a closed input-output model is presented. The input-output model takes into account five sectors of the economy: environmental, which is of primary interest here; agricultural; industrial; construction; and service; but does not include branches of a sector, and therefore can give only global information on an entire sector. The starting point of the model is that environmental policies will create certain activities which are primarily directed at preventing or reducing pollution. The quality standard and the time period for achieving the standard, two important parameters in the model, affect the nature of the expenditure effects and the price effects. In accordance with The Netherlands 1971 Act on Pollution of Surface Waters, the 'polluter pays' principle is assumed. Also discussed are degradable organic pollution and its alleviation by the

methods suggested by results from the model. The limited availability of adequate statistical data on the national level, and the segmentation of the larger topic of water pollution control into the specific area of water pollution by degradable organic matter leave the results of the model study clouded. (Becker-Wisconsin)
W75-11254

PITLESS ADAPTERS: EMPHASIS ON SANITATION,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
For primary bibliographic entry see Field 8C.
W75-11258

CONOCO TECHNOLOGY CURBS PRODUCTION POLLUTION,
Continental Oil Co., Houston, Tex.
C. L. Million.
Petroleum Engineer, Vol 45, No 9, p 42-46, August, 1973. 3 fig, 3 tab.

Descriptors: *Pollution abatement, Technology, Design, Methodology, Oil industry, Oil pollution, Industrial production, Water pollution, Air pollution, Pollutant identification, Water pollution control.

Potential pollution causes can be controlled by properly applied technology, though in some cases the technology has not yet become inexpensive enough to be practically applied. Some new technology is needed to meet air emission standards. A technique of evaluating pollution risk of the major subsystems of an overall production system is presented. Specific suggestions and examples of this applied technology are given. (Bradbeer-NWWA)
W75-11267

WORKSHOP ON COMPUTER-AIDED DESIGN AND SIMULATION OF WASTE TREATMENT SYSTEMS.
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5D.
W75-11338

B(RITISH) C(OLUMBIA) PRESSES FOR FOREST INDUSTRIES CLEAN-UP.
Water and Pollution Control, Vol 113, No 6, p 21-22, June, 1975. 3 illus.

Descriptors: *Water pollution control, *Pulp and paper industry, *Canada, Foreign countries, Legislation, Pollution abatement, Costs, Wastes water(Pollution), Water pollution sources, Industrial wastes, Wastes, Water pollution, Wood wastes, Sulfite liquors.
Identifiers: *British Columbia, Forest industries, Sulfite mills, Floating debris.

Millions of dollars are being spent by British Columbia's forest industry to meet the provincial government's policies on water pollution. The pollution regulations are aimed at controlling waste water discharges and containing floating debris (logging residues and logs) in the waterways. Hardest hit has been the province's pulp and paper industry. The sulfite mills, built at the turn of the century when environmental considerations were not an issue, bear the heaviest costs. Pollution control programs for British Columbia's two sulfite mills, Candian Cellulose Co. (Prince Rupert) and Rayonier Canada Ltd. (Port Alice), are estimated at $95 million. The introduction of pollution abatement equipment at these mills will reduce foaming in the receiving waters, reduce fiber losses, and lower the concentration of pollutants in the waste discharges. Current legislation controlling water pollution is already under review by the provincial government. (Witt-IPC)
W75-11350

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOL. II, ASPECTS OF COMPUTATION,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W75-10900

RELATIVE IMPORTANCE OF DECISION VARIABLES IN FLOOD FREQUENCY ANALYSIS,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 4A.
W75-10929

PRESCRIPTIVE ECONOMIC MODELS FOR NONSTRUCTURAL FLOOD CONTROL,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 6F.
W75-11060

A MATHEMATICAL MODEL FOR OPTIMAL WASTE LOAD ALLOCATIONS,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 5G.
W75-11102

COMPUTER SYSTEMS AND WATER RESOURCES,
Polytechnic Institute of New York, Brooklyn; and Illinois Univ., Chicago.
G. Bugliarello, and F. J. Gunther.
Developments in Water Science 1. Elsevier Scientific Publishing Company, Amsterdam, The Netherlands, 1974. 202 p, 38 fig, 16 tab, 210 ref, 9 append. $17.30.

Descriptors: *Water resources, *Technology, *Computers, Methodology, Decision making, Management, Systems analysis, Mathematical models, Groundwater, Surface waters, Water utilization, Optimization, Simulation analysis, Forecasting, Planning, Design, Data processing, Computer programs, *Reviews, *Bibliographies.
Identifiers: Process control, Hardware, Software, *Data acquisition.

The advent of the computer has provided water resources technology with a powerfully efficient tool for the design, planning, management, and operation of water systems. Presented is a state-of-the-art overview of some of the principal considerations in the use of computer systems for water resource practitioners and decision makers. Important trends and issues having impact upon water resources technology are discussed under the general terms of hardware, software, and methodology; focused upon are major areas of computer application in water resources, including data acquisition and management, process control, and system analysis and design. These computer tasks are examined in the contexts of surface water, ground water, and water utilization systems. The methods of dynamic programming, Monte Carlo, Simulation analysis, optimal control theory, relaxation, finite difference, and finite element are considered in the use of computers for surface and ground water systems. The overall issue is whether there should be national possibly international strategies governing the use of computers in water resources. It is recommended that guidelines or agreements be derived in order to establish a comprehensive computer strategy for water resources. Existing and potential principal elements of a structure of the interface between computer systems and water resources technology are considered, i.e., data banks for storage, management and dissemination of information, and a set of problem-oriented computer language. (Bell-Cornell)
W75-11174

IMPROVED DESIGN OF DISTRIBUTION NETWORKS BY MINIMUM ROUTE,
Nihon Suido Consultants Co., Tokyo (Japan).
For primary bibliographic entry see Field 4A.
W75-11175

TREATMENT PLANT MONITORING PROGRAMS: A PRELIMINARY ANALYSIS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W75-11176

THE LOUISIANA ENVIRONMENTAL MANAGEMENT SYSTEM AND ITS UTILITY IN WATER RESOURCE PLANNING,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 5G.
W75-11177

STRATEGIC APPROACH TO ESTUARINE ENVIRONMENTAL MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-11179

DISTRIBUTION-SYSTEM OPERATION ANALYSIS MODEL,
Omaha Metropolitan Utilities District, Nebr. Services Dept.
For primary bibliographic entry see Field 5D.
W75-11180

SIMULATION OF WATER QUALITY MANAGEMENT POLICIES,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 5G.
W75-11181

COMPUTER ANALYSIS OF WATER-DISTRIBUTION SYSTEMS,
Springfield Dept. of Water, Light and Power, Ill.
For primary bibliographic entry see Field 4A.
W75-11182

ADVANCED TECHNIQUES IN THE MATHEMATICAL MODELING OF WATER-DISTRIBUTION SYSTEMS,
Beck (R. W.) and Associates, Seattle, Wash.
For primary bibliographic entry see Field 4A.
W75-11183

MACROSCOPIC DISTRIBUTION-SYSTEM MODELING,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
For primary bibliographic entry see Field 4A.
W75-11185

AN ECONOMIC ANALYSIS OF THE POLLUTION PROBLEMS IN THE COLORADO RIVER BASIN: THE UPPER MAIN STEM SUB-BASIN,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 5G.
W75-11247

6B. Evaluation Process

COVARIANCE ANALYSIS OF RESERVOIR DEVELOPMENT EFFECTS ON PROPERTY TAX BASE,
Kentucky Water Resources Inst., Lexington.
C. M. Vaughan, Jr.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 582, $6.25 in paper copy, $2.25 in microfiche. Research Report No 4, 1967. 144 p, 4 fig, 58 tab, 63 ref. OWRT A-006-KY, 14-01-0001-1085.

Descriptors: Reservoirs, *Tax rates, Taxes, Flood plains, *Kentucky, *Property values, Reservoir construction, Benefits, Costs, Evaluation, Economics, *Statistical studies.
Identifiers: *Covariance analysis, Lake Cumberland(Kent).

This study tests the hypothesis that a reservoir (Lake Cumberland) has affected the property tax base in the three counties in which it is located so as to increase at a more rapid rate than that in two other groups of counties in the same area. One of the two other groups consisted of counties in the flood plain, downstream from the dam, the other group consists of counties adjacent to the first two groups. The study also seeks to evaluate the benefits to the property tax base in the flood-plain counties. The study uses the analysis of covariance model to test the hypothesis. Use of the analysis of covariance model separates the rate of change in property tax base in the affected area from in two other areas. The primary source of data are samples of rural and urban real estate transactions. Secondary data sources include assessed value of real property and estimated market value of real property. The statistical analysis showed the property tax base to be increasing more rapidly in the counties containing the reservoir than in the other groups of counties. The greatest increase in urban property sale values was found in a town in the flood plain. These statistical results suggest that the initial loss in the tax base caused by land removed from the tax rolls was recovered in time through more rapid expansion in the tax base. (Huffsey-Kentucky)
W75-10851

SOCIAL IMPACTS OF WATER RESOURCES DEVELOPMENTS AND THEIR IMPLICATION FOR URBAN AND RURAL DEVELOPMENT: A POST AUDIT ANALYSIS OF THE WEBER BASIN PROJECT IN UTAH,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
W. H. Andrews, G. E. Madsen, and G. J. Legaz.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 519, $7.00 in paper copy $2.25 in microfiche. Research Monograph No 4, December 1974 178 p, 54 tab, 3 fig, 59 ref, append. OWRT C-2192(No 3408)(1).

Descriptors: *Social impact, Social change, Irrigation, Recreation, Flood control, Reservoirs, *Utah, Post-impoundment, Attitudes, *Social values, Social adjustment, *Urban sociology, Energy, Municipal water, Industrial water, Water demand, Water utilization, *Weber Basin Project(Utah), *Post audit analysis.

A post-audit methodology, utilizing both primary and secondary data sources, was applied to the Weber Basin Project in Utah to identify original goals of the project, changes in goals and selected social impacts of the project. The major components were: municipal and industrial, irrigation, recreation, flood control, and power. The important changes occurred between the authorizing act and both later planning documents and post-construction use which were related to changing social conditions and priorities. Present social impacts were also identified. Important impacts of Weber water were: feelings of security associated with the assured, dependable supply, ability to provide for increased population, provide for late crops and gardens and recreational use. Among the negative impacts were hardness of the water, chlorine taste, and operation and maintenance costs. There was evidence that recreational impacts of the project were underestimated. Up to 1973, flood control benefits were estimated at $1,230,000 using a Corps of Engineers method. There was also a low degree of anxiety concerning future flooding by the public. However, certain irrigation officials identified flood control problems associated with the project. Power usage by the project generally has been lower than predicted but sales of excess power have been greater than predicted.
W75-10854

HUMAN OBSTACLES TO THE CONTROL OF THE HYDROLOGICAL CYCLE FOR THE BENEFIT OF MAN,
Technion - Israel Inst. of Tech. Haifa (Israel). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W75-10866

AN ANALYSIS OF THE MOTOR-ROW CONVERSION ISSUE OF COLORADO RIVER FLOAT TRIPS,
Arizona Univ., Tucson. Dept. of Watershed Management.
D. K. Larson.
Arizona University, Tucson, Department of Watershed Management, MS Thesis, 1974. 171 p, 19 fig, 36 tab, 4 append, 33 ref.

Descriptors: *Environmental effects, *Colorado River, *Boating, *Balance of nature, *Watershed management, Recreation, Water utilization, Rivers, River regulation, National parks, National recreation areas, Water pollution control
Identifiers: Motor-row issue.

River float trips on the Colorado River through Marble and Grand Canyons dramatically increased within the last ten years, so much so that the National Park Service has decided to reduce the number of river trip participants and require all motorized trips to convert to oar-powered trips by 1977 to reduce the impact on the ecological system. These policies have become major management concerns identified as the motor-row issue which consists of four divisions; limitation of use, perception of wilderness, user agreement with conversion, and user preference for type of trip. Data were collected with self-administrated questionnaires distributed at one pre-trip and four post-trip sites. Results indicated that there was not a definitive positon of the user population regarding conversion, users are divided in their agreement with conversion policies and preference for type of trip. These results will yield definitive conclusions regarding conversion when the National Park Service defines the desired populations of participations through management goals and objectives. (McLachlan-Arizona)
W75-10867

THE AWARENESS OF THE RELEVANT WATER RESOURCES LITERATURE BY THE PERSONNEL OF THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES,
Wisconsin Univ., Madison. Library School.
For primary bibliographic entry see Field 10C.
W75-10899

A CASE STUDY OF SOME ECONOMIC ASPECTS OF THE NATIONAL FLOOD INSURANCE PROGRAM,
Mississippi State Univ., Mississippi State. Div. of Business Research.
For primary bibliographic entry see Field 6F.
W75-10906

FLOODPLAIN LAND-USE MANAGEMENT: AN APPLICATION OF OPERATIONS RESEARCH METHODOLOGY,
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6F.
W75-11037

THE ECONOMICS OF FLOOD INSURANCE: AN ANALYSIS OF THE NATIONAL FLOOD INSURANCE PROGRAM,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 6F.
W75-11038

WATER APPLICATION PRACTICES AND LANDSCAPE ATTRIBUTES ASSOCIATED WITH RESIDENTIAL WATER CONSUMPTION,
New Mexico State Univ., University Park. Dept. of Horticulture.
For primary bibliographic entry see Field 3D.
W75-11059

A MATHEMATICAL MODEL FOR OPTIMAL WASTE LOAD ALLOCATIONS,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 5G.
W75-11102

THE LOUISIANA ENVIRONMENTAL MANAGEMENT SYSTEM AND ITS UTILITY IN WATER RESOURCE PLANNING,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 5G.
W75-11177

SIMULATION OF WATER QUALITY MANAGEMENT POLICIES,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 5G.
W75-11181

AN ECONOMIC ANALYSIS OF THE POLLUTION PROBLEMS IN THE COLORADO RIVER BASIN: THE UPPER MAIN STEM SUB-BASIN,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 5G.
W75-11247

ECONOMICS OF GREAT LAKES SHIPPING IN AN EXTENDED SEASON,
Michigan Univ., Ann Arbor. Dept. of Naval Architecture and Marine Engineering.
For primary bibliographic entry see Field 6C.
W75-11248

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: MEAT PACKING INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W75-11249

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES. FERROALLOYS INDUSTRY.
Kearney (A. T.) and Co., Inc., Chicago, Ill.
For primary bibliographic entry see Field 5G.
W75-11250

NON-RENEWABLE, NON-ENERGY RESOURCES,
Leicester Univ (England). Public Sector Economics Research Centre.
D. Pearce.
Environmental Economics Study Group Series 13, (1975). 5 p, 62 ref.

Descriptors: *Bibliographies, *Withdrawal, *Resource allocation, *Natural resources, *Mining, Economic impact, Economic life, Taxes, Metals, Forests, Dependable supply, Conservation, Recycling.
Identifiers: *Minerals, Resource depletion, Raw materials.

This bibliography, prepared by the Environmental Economics Study Group of Leicester University, England, contains 62 references. Included among the reference titles are the topics of optimal growth under depletion conditions, the economics of scarcity and growth, resource conservation, mineral reserves and resources, recent theory of exhaustible resources, extractive resources and taxation, intergenerational equity and exhaustible resources, and the life cycle of non-ferrous minerals. The period of 1931-1975 is included within the references. (Becker-Wisconsin)
W75-11253

THE ECONOMIC IMPACT OF POLLUTION ABATEMENT: THE CASE OF WATER POLLUTION BY DEGRADABLE ORGANIC MATTER,
Centraal Planbureau, The Hague (Netherlands).
For primary bibliographic entry see Field 5G.
W75-11254

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COVARIANCE ANALYSIS OF RESERVOIR DEVELOPMENT EFFECTS ON PROPERTY TAX BASE,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6B.
W75-10851

SUCCESSFUL IRRIGATION: PREPARATION, REALIZATION, EXPLORITATION, (SAVOIR IRRIGUER: PREPARATION, REALISATION, EXPLOITATION),
California Univ., Davis. Dept. of Irrigation.
For primary bibliographic entry see Field 3F.
W75-10874

HIGH COSTS MODIFY SEWAGE PLANT EXPANSION.
For primary bibliographic entry see Field 5D.
W75-10993

COST EVALUATION OF WATERCOURSE MANAGEMENT IN ESSEX,
Cambridge Univ. (England). Dept. of Applied Biology.
For primary bibliographic entry see Field 5G.
W75-11008

HOW TO ESTIMATE AND ESCALATE COSTS OF WASTEWATER EQUIPMENT,
ICARUS Corp., Silver Spring, Md.
For primary bibliographic entry see Field 5D.
W75-11014

COST SHARING TO HELP CLEAN OUR WATERWAYS.
For primary bibliographic entry see Field 5G.
W75-11023

THE ECONOMY OF VARIOUS METHODS FOR DEWATERING SLUDGE FROM BIOLOGICAL PURIFICATION (UEBER DIE WIRTSCHAFTLICHKEIT VERSCHIEDENER VERFAHREN ZUR ENTWAESSERUNG VON BIOLOGISCHEM KLAERSCHLAMM),
Uhde (Friedrich) G.m.b.H., Dortmund (West Germany).
For primary bibliographic entry see Field 5D.
W75-11127

AN IMPLICIT APPROACH TO PRICING AGRICULTURAL WATER TRANSFERS TO URBAN USES,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W75-11178

ECONOMICS OF GREAT LAKES SHIPPING IN AN EXTENDED SEASON,
Michigan Univ., Ann Arbor. Dept. of Naval Architecture and Marine Engineering.
H. Nowacki, H. Benford, and A. Atkins.
Available from the National Technical Information Service, Springfield, Va. 22161, as COM-73-10930, $4.75 in paper copy, $2.25 in microfiche. Report No 139, January 1973. (Marine Administration RD-900-73039) 93 p, 14 fig, 10 tab, 14 ref, append. MA 1-35487.

Descriptors: *Winter, *Great Lakes, *Ships, *Transportation, *Cost-benefit analysis, Computer programs, Economic impact, Iced lakes, Inland waterways, Estimating, Design, Optimization, Operations, Benefits.
Identifiers: *Shipowners, *Bulk carriers, Ship designs, Winter navigation, Shipping fleets, Investory costs.

The capabilities of a computer program developed to project economic benefits to shipowners from extensions of the operating season are presented. The program inputs data concerning trade routes between most ports on the Great Lakes, ship types, ice types, winter severity, and ship characteristics, with the restrictions that (1) the cargo is iron ore pellets, (2) the ships are U.S. built and operated, with only a moderate degree of automation, and (3) the hulls are largely of mild steel. Outputted by the analysis are: cost of service per ton of cargo, required freight rate, net present value, yield, and capital recovery factor. The computer program is being developed to answer the questions of how best to modify and enhance ships for winter navigation, and how late in the season to continue operations. A description of the computer program and summarized results of several parametric studies using the program are included. Optimization on an individual fleet basis, with the assignment of a different length of operating season to each ship on the basis of efficiency, is considered. Also important in estimating total economic benefits is reduced inventory costs. Conclusions as a result of program output are made concerning extended season shipping on the Great Lakes. (Becker-Wisconsin)
W75-11248

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: MEAT PACKING INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W75-11249

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES. FERROALLOYS INDUSTRY.
Kearney (A. T.) and Co., Inc., Chicago, Ill.
For primary bibliographic entry see Field 5G.
W75-11250

THE ECONOMIC IMPACT OF POLLUTION ABATEMENT: THE CASE OF WATER POLLUTION BY DEGRADABLE ORGANIC MATTER,
Centraal Planbureau, The Hague (Netherlands).
For primary bibliographic entry see Field 5G.
W75-11254

WILL SUBMERSIBLES MAKE JET PUMPS OBSOLETE.
For primary bibliographic entry see Field 8C.
W75-11263

UNCONVENTIONAL AIR DRILLING REDUCES WELL COSTS.
For primary bibliographic entry see Field 8C.
W75-11270

DRILLING RATE AFFECTS COSTS MORE THAN BIT LIFE,
Sandia Labs., Albuquerque, N. Mex.
For primary bibliographic entry see Field 8C.
W75-11279

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 8: NEEDLESS SPENDING OF DRILLING AND EXPLORATION MONEY CAN BE PREDICTED-AND PREVENTED,
Continental Oil Co., Houston, Tex. Production Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11298

SOME OBSERVATIONS ON RAINFALL IN WESTERN NEW SOUTH WALES,
New South Wales Univ., Kensington (Australia). School of Wool and Pastoral Sciences.
For primary bibliographic entry see Field 2B.
W75-11304

UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 3). CHOOSING THE OPTIMUM FINANCIAL STRATEGY,
Commins (J. A.) and Associates, Inc., Fort Washington, Pa.
For primary bibliographic entry see Field 5D.
W75-11322

POLLUTION ABATEMENT IN A BREWING FACILITY.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 5D.
W75-11323

UPGRADING POULTRY-PROCESSING FACILITIES TO REDUCE POLLUTION. (PART 2). PRETREATMENT OF POULTRY-PROCESSING WASTES,
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 5D.
W75-11329

6D. Water Demand

SOCIAL IMPACTS OF WATER RESOURCES DEVELOPMENTS AND THEIR IMPLICATION FOR URBAN AND RURAL DEVELOPMENT: A POST AUDIT ANALYSIS OF THE WEBER BASIN PROJECT IN UTAH,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
For primary bibliographic entry see Field 6B.
W75-10854

THE IMPACT OF THE SAFE DRINKING WATER ACT ON UTILITIES,
Boston Metropolitan District Committee, Mass.
For primary bibliographic entry see Field 5G.
W75-10859

WATER CONSUMPTION AND WATER TURNOVER OF SHEEP GRAZING SEMIARID PASTURE COMMUNITIES IN NEW SOUTH WALES,
Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Riverina Lab.
For primary bibliographic entry see Field 3F.
W75-10888

STREAMFLOW IN THE NEW YORK PART OF THE SUSQUEHANNA RIVER BASIN,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 2E.
W75-10931

IMPROVED DESIGN AND OPERATING CRITERIA FOR RURAL WATER DISTRICTS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
J. E. Garton.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 691, $4.75 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 67 p, 27 fig, 4 tab, 16 ref, 3 append. OWRT B-028-OKLA(2).

Descriptors: *Design criteria, Operations, *Water districts, *Water demand, *Oklahoma, Optimum development plans, Data collections, Water uses, Water utilization, Water supply, Pumping, Dairy industry, Industrial water.
Identifiers: *Rural water district, Payne County(Okla).

Data were obtained on Rural Water District No. 3, Payne County, Oklahoma. There was a significantly different pattern of usage for three classes of customers. The average monthly usage per tap ranged from 8768 to 19183 gallons for dairies, 4357 to 11983 gallons for Class A taps, and 2537 to 4160 gallons for Class B taps. The average monthly usage per person ranged from 1424 to 2821 gallons for Class A taps and from 989 to 1664 gallons for Class B taps. Optimal design values for daily demand were in the range of: 350 gallons per tap; 200 gallons per Class B tap; 350 gallons per Class A tap; 600 gallons per Dairy tap; 12 gallons per dairy cow milked; 100 gallons per person; 90 gallons per person, Class B tap; and 150 gallons per person, Class A tap. Optimal design values for peak demand ranged from: 1.0 to 1.5 gallons per minute per tap; 1.3 to 1.8 gallons per minute per Class A tap; 0.6 to 0.9 gallons per minute per Class B tap; 0.6 to 0.8 gallons per minute per person; 0.5 to 0.7 gallons per minute per person, Class A tap; and 0.3 to 0.6 gallons per minute per person, Class B tap. The optimal period off-peak pumping time is from 10 p.m. to 7 a.m., a period of 9 hours.
W75-11056

WATER APPLICATION PRACTICES AND LANDSCAPE ATTRIBUTES ASSOCIATED WITH RESIDENTIAL WATER CONSUMPTION,
New Mexico State Univ., University Park. Dept. of Horticulture.
For primary bibliographic entry see Field 3D.
W75-11059

CONSOLIDATION AND REHABILITATION OF CANALS IN POUDRE VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W75-11061

6E. Water Law and Institutions

THE RESPONSIBILITY OF U.S. WATER SUPPLIERS,
Senate, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10856

FACING THE REAL COST OF CLEAN WATER,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10857

THE IMPACT OF THE SAFE DRINKING WATER ACT ON UTILITIES,
Boston Metropolitan District Committee, Mass.
For primary bibliographic entry see Field 5G.
W75-10859

INTERNATIONAL DEVELOPMENT STRATEGIES FOR THE SAHEL.
For primary bibliographic entry see Field 4A.
W75-10861

HUMAN OBSTACLES TO THE CONTROL OF THE HYDROLOGICAL CYCLE FOR THE BENEFIT OF MAN,
Technion - Israel Inst. of Tech. Haifa (Israel). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W75-10866

IMPACT OF ENERGY DEVELOPMENT ON THE LAW OF THE COLORADO RIVER,
California Univ., Los Angeles. School of Law.
For primary bibliographic entry see Field 4C.
W75-10869

INTERBASIN WATER TRANSFERS: A CASE STUDY IN MEXICO,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 4A.
W75-10879

THE LAW OF WATER ALLOCATION IN KENTUCKY,
Kentucky Water Resources Inst., Lexington.
R. C. Ausness, and B. H. Flynn.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-244 534, $4.25 in paper copy, $2.25 in microfiche. Research Report No. 86, July 1975. 81 p. OWRT A-060-KY(1). 14-31-0001-5017.

Descriptors: Legal aspects, Legislation, Water law, Water policy, Water Resources Development, *Kentucky, *Water allocation(Policy), *Water distribution(Applied), Consumptive use, *Administration, Navigation, Disposal.

This study discusses navigability concepts, consumptive rights to surface and ground waters, the disposal of diffused surface waters and the administration of Kentucky's statutory water allocation system. Federal regulatory powers are based on navigability as is state ownership of submerged lands. Kentucky uses the ebb-and-flow test of navigability to determine title to submerged lands but uses a navigability-in-fact test to determine the scope of state regulatory authority. Consumptive uses of water in Kentucky are governed by the riparian land-owner to use as much water as he needs as long as his use does not interfere with the legitimate uses of other riparians. Underground streams are subject to the same consumptive use rules, but an overlying landowner can use as much percolating ground water as he needs even though other users are harmed. Kentucky follows the civil law rule with respect to the disposal of diffused surface water, but recent cases seem to have applied the more modern reasonable use rule. In addition to these common-law rules, the Department for Natural Resources and Environmental Protection, under the provisions of KRS Chapter 151, administers a permit system under which both riparian and nonriparian users are allowed to make beneficial uses of water. (Huffsey-Kentucky)
W75-10898

INFORMATION AS A REGULATORY TOOL IN WATER QUALITY CONTROL,
Wisconsin Univ., Madison. Land Tenure Center; and Wisconsin Univ., Madison. Dept. of Agricultural Journalism.
For primary bibliographic entry see Field 5G.
W75-10903

WATER POLLUTION PROBLEMS IN SALISBURY, RHODESIA: PRESENT AND FUTURE,
For primary bibliographic entry see Field 5G.
W75-10983

WATER CONSERVATION IN SWEDEN: III. CURRENT TRENDS,
Ministry of Agriculture, Stockholm (Sweden).
For primary bibliographic entry see Field 5G.
W75-10987

ROLE AND RESPONSIBILITIES OF THE ENVIRONMENTAL PROTECTION SERVICE (CANADA),
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 6G.
W75-11000

WATER RESOURCES,
British Columbia Water Resources Service, Vancouver.
For primary bibliographic entry see Field 5G.
W75-11003

MILESTONE WATER LEGISLATION ACCOMPANIED BY MILLSTONE OF BUREAUCRATIC RED TAPE,
Hampton Roads Sanitary District, Norfolk, Va.
For primary bibliographic entry see Field 5G.
W75-11007

INDUCED INFILTRATION SUPPLY SYSTEM AMONG BIGGEST.
For primary bibliographic entry see Field 5F.
W75-11010

LEGAL AND INSTITUTIONAL PROBLEMS IN THE MANAGEMENT OF SALINITY,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 5G.
W75-11047

INSTITUTIONAL ARRANGEMENTS FOR REDUCING CONFLICT OVER WATER QUALITY IN INTERNATIONAL RIVERS,
Arizona Univ., Tucson. Inst. of Government Research.
J. R. Wagner.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 821, $3.75 in paper copy, $2.25 in microfiche. Completion Report, August 1975. 48 p, 36 ref, 3 append. OWRT A-057-ARIZ(1), 14-31-0001-4003.

Descriptors: *International Joint Commission, *International Bound and Water Comm, *Water policy, *Political aspects, Administrative agencies, Organizations, Legislation, *Institutional constraints, Quality control, International water, *Water quality, United States, Canada, Mexico, Colorado River, Columbia River, Salinity.
Identifiers: International rivers, Downstream benefits.

Institutional arrangements coping with the problem of water quality in international rivers were examined. Findings are restricted to the evidence available and are tentative only. Both the International Boundary and Water Commission (United States-Mexico) and the International Joint Commission (United States-Canada) are adequately meeting technical problems of quality control in their respective jurisdictions. Political aspects of water policy, however, caused delays in solving the salinity problem on the Colorado River and the downstream benefits issue on the Columbia River. These problems were beyond the jurisdiction of the IBWC and the IJC and necessitated action at higher, policy-making, levels of government.
W75-11242

TRANSLATIONS ON ENVIRONMENTAL QUALITY, NO. 33.
Joint Publications Research Service, Arlington, Va.
For primary bibliographic entry see Field 5G.
W75-11246

THE WATER INDUSTRY IN TRANSITION,
National Water Council, London (England).
For primary bibliographic entry see Field 3E.
W75-11252

B(RITISH) C(OLUMBIA) PRESSES FOR FOREST INDUSTRIES CLEAN-UP.
For primary bibliographic entry see Field 5G.
W75-11350

6F. Nonstructural Alternatives

A CASE STUDY OF SOME ECONOMIC ASPECTS OF THE NATIONAL FLOOD INSURANCE PROGRAM,
Mississippi State Univ., Mississippi State. Div. of Business Research.
L. R. Cheatham.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 506, $4.25 in paper copy, $2.25 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1975. 56 p, 6 fig, 16 tab, 14 ref. OWRT A-087-MISS(1).

Descriptors: *Flood Plain Insurance, Economics, *Mississippi, *Investment, *Property values, Government supports, Government finance.
Identifiers: Columbus(Miss).

The objective was to determine the impact of federally subsidized flood insurance on urban flood plain development in Columbus, Mississippi. The scope of study was limited to determining the effect on business investment and property values. Evidence indicates that the availability of federally subsidized flood insurance has had little effect on the initial location decisions of either business or non-business properties in Columbus, Mississippi. However, mass flood plain encroachment has occurred since 1968, and there is some evidence that the availability of low-cost insurance may be responsible for businesses and residents remaining on the lands. Data indicate that higher premium rates, which would exist if actuarial rates were charged, would result in a major reduction in the number of policies in force. It appears in the Columbus case that federal disaster aid is more responsible for the current level of commercial investment than subsidized flood insurance.
W75-10906

FLOODPLAIN LAND-USE MANAGEMENT: AN APPLICATION OF OPERATIONS RESEARCH METHODOLOGY,
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
J. F. Smiarowski, C. Willis, and J. H. Foster.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 729, $4.25 in paper copy, $2.25 in microfiche. Massachusetts Water Resources Research Center, Amherst, Publication No 45, January 1975. Special Report, 44 p, 18 tab, 44 ref, 2 append. OWRT B-028-MASS(5) and B-043-MASS(3). 14-31-0001-5081.

Descriptors: Flood plains, Management, *Decision making, *Flood plain zoning, *Connecticut, *Mathematical models, *Land use, Model studies, Benefits, Costs, Economics, *Operations research.
Identifiers: *Economic analysis, Farmington(Conn).

Three models are presented from an investigation of the economic potential of land-use management or zoning for a floodplain in Farmington, Connecticut. The analysis demonstrates the potential usefulness of operations research methods to flood zone decision-makers, and it provides a set of (conditional) normative decisions which may be of value to the community under investiation. A review was conducted of the literature concerning applications of quantitative methods of problems of floodplain land-use. The mathematical programming methodology is developed, as is the treatment of the empirical results of the application. A general discussion on the distribution (incidence) of benefits and costs of floodplain land-use management among the various sectors of the society is also presented. The use of mathematical programming can aid land-use decisions by identifying economically optimum land-use patterns. The framework of the three models is flexible enough to include aspects of flood proofing and landfill. The material developed will be used along with that developed in similar studies of other flood water management alternatives to determine an optimum flood management system for the Connecticut River basin.
W75-11037

THE ECONOMICS OF FLOOD INSURANCE: AN ANALYSIS OF THE NATIONAL FLOOD INSURANCE PROGRAM,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
G. A. Vaut.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 715, $4.75 in paper copy, $2.25 in microfiche. Massachusetts Water Resources Research Center, Amherst, Publication No 46, July 1974. 72 p, 11 tab, 136 ref, Special Report. OWRT B-028-MASS(4) and OWRT B-043-MASS(2).

Descriptors: *Flood plain insurance, Economics, *Risks, *Welfare(Economics), Water policy, Management, Evaluation.
Identifiers: *National Flood Insurance Program.

The purpose was to provide information relevant to the role of flood insurance as a floodplain management/flood loss reduction measure. The first section of the report summarizes the history of the formulation of the current national flood insurance program and its major provisions. The second section assesses the implications for flood insurance of two areas of economic theory: individual behavior under uncertainty and welfare economics. The principle of the existence of a certainty equivalent and risk premium has been established in theory. The existence of a residual degree of risk aversion in some individuals has already been demonstrated to support an economically efficient flood insurance arrangement. Some important policy implications are implied by the lexicographic model developed for this study. A change in status for flood insurance, from an endogenous alternative to an exogenous institutional given, must be recognized by flood plain policy makers.
W75-11038

PRESCRIPTIVE ECONOMIC MODELS FOR NONSTRUCTURAL FLOOD CONTROL,
Cornell Univ., Ithaca, N.Y.
W. F. Bialas.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 720, $7.00 in paper copy, $2.25 in microfiche. Technical Report No 97, Cornell University Water Resources and Marine Sciences Center, Ithaca, New York June 1975. 184 p, 21 fig, 2 tab, 68 ref, 4 append. OWRT C-5240(No 4230)(2).

Descriptors: *Flood plains, *Flood plain zoning, *Land use, *Non-structural alternatives, *Linear programming, Alternative planning, Optimization, Economic efficiency, Probability, Equations, Mathematical models, System analysis.

A linear programming model is developed to select optimal floodplain management plans which will reduce damage due to inundation and be economically and environmentally sound. The technique is intended for relatively inexpensive screening of floodplain management alternatives before carrying out a plan-by-plan search with more detailed and expensive methods of analysis. Viewing the floodplain as a land use allocation problem in three dimensions, this formulation permits a direct assessment of expected flood damage on the basis of location and elevation. The model discretizes time, flood losses, topography, and building heights. Decision variables include changes in the land use allocation in the floodplain; shifts in the activity schema of developed basins can be handled. Also, the effects of the floodwater displaced by various activities can be explicitly measured and included as a component of flood risk. Techniques to account for environmental impact when flooding does not occur are also incorportated. The ambient concentrations of residuals at each site are calculated as a function of the degree and type of land use activity of all sites. The model defines the amount of generated residual to be treated at each location to maintain the desired environmental quality standards. The standards are themselves functions of the land use allocation plan, with each plan evaluated on the basis of capital costs required for land use reallocation, change in land rent, and change in residuals treatment costs, if any. (Bell-Cornell)
W75-11060

6G. Ecologic Impact Of Water Development

MAN'S INFLUENCE ON THE HYDROLOGICAL CYCLE: A DRAFT REPORT OF THE UNESCO/FAO WORKING GROUP ON THE INTERNATIONAL HYDROLOGICAL DECADE.
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 2A.
W75-10863

BALANCING THE EFFECTS OF MAN'S ACTIONS ON THE HYDROLOGICAL CYCLE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 2A.
W75-10865

AN ANALYSIS OF THE MOTOR-ROW CONVERSION ISSUE OF COLORADO RIVER FLOAT TRIPS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 6B.
W75-10867

ROLE AND RESPONSIBILITIES OF THE ENVIRONMENTAL PROTECTION SERVICE (CANADA),
Environmental Protection Service, Ottawa (Ontario).
L. Edgeworth.
In: Proceedings of the Annual Conference of British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 59-69.

Descriptors: *Water pollution control, *Legislation, *Canada, Environmental control, Administration.

The history and duties of the Environmental Protection Service of Canada are discussed. The EPS is concerned not only with activities that are directly tied to environmental protection but also with the management and improvement of

Canada's renewable resources such as fisheries, forestry and wildlife. The Fisheries Act, the Canada Water Act, and the Fisheries Act amendments are some of the legislation that has defined the roles of the federal and local governments and provides for an optimization of benefits through rational resource management. Water pollution control is based on the use of the best practicable technology, meaning that in most cases it does the job in terms of protecting the environment, and also meaning that it does not require the impossible or the economically destructive. The goal of a balanced program is being achieved through a system of cooperation. The EPS has set up a special Environmental Emergency Branch to improve the national ability to deal with environmental accidents such as oil spills. This unit is developing contingency plans for all conceivable problems and is developing a central operations center. Newer legislation is directed toward the control of special types of products which may cause pollution problems such as gasoline additives and phosphate containing detergents. Canada is learning that energy and the environment are not two different disciplines but that the preservation of a clean environment is the result of the knowledgable application of energy through the right sources. (Orr-FIRL)
W75-11000

OIL SPILL TECHNOLOGY,
Environmental Protection Service, Ottawa (Ontario). Environmental Emergency Branch.
For primary bibliographic entry see Field 5G.
W75-11001

FRESHWATER ECOSYSTEM RESEARCH IN WATER QUALITY MANAGEMENT,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
J. Ferris, N. L. Clesceri, and S. I. Auerbach.
Environmental Science and Technology, Vol 8, No 8, p 706-710, August, 1974. 3 fig, 2 tab, 5 ref.

Descriptors: *Water quality, Management, *Biomes, Freshwater, *Ecosystems, Lakes, Reservoirs, Forests, Deserts, Environmental control, Fish, Aquatic life, *United States.

Teams of U.S. scientists from many disciplines combined to study total ecosystems in the U.S. The International Biological Program was created to help define the biological basis of productivity for human welfare, investigation organic production on land, in fresh waters, and in seas, potentialities and uses of new natural resources, and human adaptability to a changing environment. A common goal was the achievement of information that would lead to rational resource management for fresh water ecosystems. The ability of proper assessment was founded on a simplified method, and the predictability of changes in the conditions and dynamics of ecosystems was demonstrated by ecosystem modeling. More than 80 lakes were studied. The U.S. was integrated into biomes of living organisms, with each community exhibiting its own scientific similarity. The Tundra Biome concentrated on natural and exogenously disturbed ecosystems in the wet Arctic tundra. The Desert Biome investigated abiotic and biotic systems and built question-oriented submodels describing a series of relationships allied to organism function within the ecosystem. The Coniferous Forest Biome assessed forest and urban land-use influences, energy sources for aquatic food chains, and the structure and metabolism of communities and their nutrient budgets. The Eastern Deciduous Forest Biome concentrated on the IBP goal of better ecosystem understanding and the prediction of results from changes induced by man. (Leibowitz-FIRL)
W75-11012

GUIDELINES FOR REVEGETATION AND STABILIZATION OF SURFACE MINED AREAS IN THE WESTERN STATES,
Colorado State Univ., Fort Collins. Dept. of Range Science.
For primary bibliographic entry see Field 4D.
W75-11100

STRATEGIC APPROACH TO ESTUARINE ENVIRONMENTAL MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-11179

MAN'S IMPACT ON A NEWLY FORMED RESERVOIR,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-11233

NON-RENEWABLE, NON-ENERGY RESOURCES,
Leicester Univ (England). Public Sector Economics Research Centre.
For primary bibliographic entry see Field 6B.
W75-11253

GUIDELINES FOR THE IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS IN THE CONSTRUCTION AND OPERATION OF A RESERVOIR,
Illinois Univ., Urbana. Dept. of Forestry.
For primary bibliographic entry see Field 5C.
W75-11316

7. RESOURCES DATA

7A. Network Design

INVESTIGATION OF THE OPERATING CHARACTERISTICS OF THE IOWA SEDIMENT CONCENTRATION MEASURING SYSTEM,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2J.
W75-11163

THE MEASUREMENT AND ESTIMATION OF LAKE EVAPORATION FROM FOUR AUSTRALIAN WATER STORAGES,
Bureau of Meteorology, Melbourne (Australia).
For primary bibliographic entry see Field 2D.
W75-11300

DIFFICULTIES IN GAUGING SMALL CATCHMENTS - A CASE STUDY,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11306

AUSTRALIAN ARID ZONE STREANGAUGING,
New South Wales Dept. of Public Works, Sydney (Australia). Water Supply and Sewerage Branch.
For primary bibliographic entry see Field 2E.
W75-11307

ASPECTS OF RAINFALL MEASUREMENT IN A NEW ENGLAND LOCATION,
University of New England, Armidale (Australia). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W75-11309

7B. Data Acquisition

MEASUREMENT OF COBBLE ABRASION IN NATURAL STREAMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2J.
W75-10881

A SIMPLE AND INEXPENSIVE TECHNIQUE FOR DETERMINING COLORED LIGHT INTENSITY UNDERWATER,
Genesee Community Coll., Batavia, N.Y. Mathematics and Science Div.
B. A. Marcus.
Water Resources Research, Vol 11, No 3, p 491-492, June 1975. 4 fig, 5 ref.

Descriptors: *Ligh intensity, *Optical properties, Light, *Instrumentation, *Light penetration, *New York, Color, Opacity, Photometry, Penetration, Turbidity, Secchi disks, Filters, Analytical techniques, Evaluation, Water, Underwater.

A technique for underwater determination of colored light intensity, relative to the surface, was presented. The technique involves using gelatin filters which are less expensive and more easily cut to fit meters than glass. (Henley-ISWS)
W75-10919

DETERMINATION OF REGIONAL HYDRAULIC CONDUCTIVITY THROUGH USE OF C-14 DATING OF GROUNDWATER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-10930

EVAPOTRANSPIRATION OF FOUR FOREST TYPES MEASURED WITH THE EDDY CORRELATION TECHNIQUE,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 2D.
W75-11044

DEVICE FOR AUTOMATIC DETERMINATION OF SUSPENDED SOLIDS CONTENT IN WATER,
Agency of Industrial Science and Technology, Tokyo (Japan). (assignee)
For primary bibliographic entry see Field 5A.
W75-11063

MEASURES OF BIODEGRADABILITY AND REFRACTORY ORGANICS IN WASTEWATERS: (ANALYSIS, INTERPRETATION, AND APPLICATION OF MEASUREMENT TECHNIQUES),
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5D.
W75-11103

NOTE ON THE MEASUREMENT OF THE RESPONSE OF OCEANOGRAPHIC TEMPERATURE SENSORS,
National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
W. S. Hurst.
Journal of Geophysical Research, Vol 80, No 18, p 2663-2666, June 20, 1975. 4 fig, 2 tab, 3 ref.

Descriptors: *Temperature, *Thermometers, *Water temperature, *Instrumentation, *Thermal properties, Physical properties, Measurement, Calibrations, Properties, Water properties, Estimating, Evaluation, Testing, Oceanography, Testing procedures, Mathematical studies, Oceans, Numerical analysis, Salinity, Analytical techniques.

Identifiers: *Oceanographic temperature sensors, *Response time, Platinum resistance sensors, Rotating water container method, Photodiode detector system, Wheatstone bridge.

The response time of three different types of oceanographic platinum resistance temperature sensors was measured employing the conventional rotating water container procedure. At low sensor immersion velocieis (less than 100 cm/s) the response was strongly dependent upon the details of the sensor insertion velocity for one sensor design. With carefully defined measurement procedures, reproducible values for the 'time constant' were obtained, but their application in data analysis must be treated with caution. (Henley-ISWS)
W75-11146

INVESTIGATION OF THE OPERATING CHARACTERISTICS OF THE IOWA SEDIMENT CONCENTRATION MEASURING SYSTEM,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2J.
W75-11163

CHARGED DROPLET COLLISION EFFICIENCY MEASUREMENTS,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 2B.
W75-11168

AQUATIC WEED FIELD TEST PROGRAM USING A CO2 ELECTRIC DISCHARGE CONVECTION LASER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5A.
W75-11208

APPLICATION OF THE MANOMETRIC TECHNIQUE IN THE STUDY OF SEDIMENT OXYGEN DEPLETION,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-11222

EXTRACTION AND ANALYTICAL TECHNIQUES FOR PESTICIDES IN SOIL, SEDIMENT, AND WATER,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5A.
W75-11236

THE UTILIZATION OF SUN-GLINT IN A STUDY OF LAKE DYNAMICS,
Canada Centre for Inland Waters, Burlington(Ontario).
For primary bibliographic entry see Field 5A.
W75-11239

A PNEUMATIC SYSTEM TO PUMP WATER FROM PIEZOMETERS,
Department of the Environment, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 8C.
W75-11257

APPARATUS FOR CONCENTRATION OF VOLATILE ORGANIC POLLUTANTS IN WATER,
Tekmar Co., Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W75-11342

7C. Evaluation, Processing and Publication

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOL. II, ASPECTS OF COMPUTATION,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W75-10900

TWO-DIMENSIONAL, HYDROSTATIC SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W75-10901

A COMPUTER PROGRAM PACKAGE FOR AQUATIC ECOLOGISTS,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 2H.
W75-10908

COMPUTER ALGORITHMS USEFUL FOR DETERMINING A SUBSURFACE ELECTRICAL PROFILE VIA HIGH FREQUENCY PROBING,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 8G.
W75-10910

AUTOMATED DISTRIBUTION OF GAUGE AND SHIFT CORRECTIONS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
K. W. Stewart.
January 1975. 29 p, 6 fig.

Descriptors: *Data processing, *Computer programs, *Stage-discharge relations, *Data storage and retrieval, Water levels, Discharge(Water), Computers, Automation, Distribution, Information retrieval, Gages.
Identifiers: Gage corrections, Shift corrections.

A set of detailed instructions was provided to explain the use of the GCSC computer program. This program will produce: (1) printouts of an expanded stage-discharge table with figures rounded to the standard rule for significant figures, along with an option to plot the curve; (2) annual page of daily mean gage corrections; and (3) annual page of daily mean shift corrections. These printouts may be used to assist in the quality checking of data from the STREAM and MANUAL computer programs or in the manual computation of daily discharge or water level data. (Scott-ISWS)
W75-10911

AUTOMATED TIDAL COMPUTATIONS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
K. W. Stewart.
January 1975. 53 p, 16 fig.

Descriptors: *Computer programs, *Data processing, *Tides, Computers, Data storage and retrieval, Gages, Automation, Water levels, Information retrieval.
Identifiers: Hourly.

A set of detailed instructions was provided to automate tidal computations by using a digitizer interfaced with a card punch. Detailed instructions were provided for digitizing water level recorder charts to obtain punched cards containing the X-Y coordinates. With these cards and the card deck defining the gage corrections, the computer program TIDAL (WSC No. J21035) is used to obtain instantaneous hourly water levels on printouts or punched cards. The TIDAL program computes instantaneous gage heights at hourly intervals. The only output options available in the TIDAL program are listings of hourly and mean gage heights and punched cards in TWL 501 format. Only rectilinear graphical charts can be processed by the TIDAL program. (Scott-ISWS)
W75-10912

FLOW FILE OPERATIONS MANUAL,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
K. W. Stewart.
January 1975. 74 p, 1 fig.

Descriptors: *Computer programs, *Data storage and retrieval, *Data processing, *Canada, Computers, Data collections, Hydrographs, Information retrieval, Streamflow, Discharge(Water), Monthly, Average, Annual.
Identifiers: Daily.

A detailed description was given of the FLOW magnetic tape file of historical daily discharges as well as detailed instructions and an explanation of the computer programs for the storage and retrieval of these data on the CDC CYBER 74 computer at the Department of Energy, Mines and Resources (EMR), Ottawa (Canada). The FLOW file now contains some 37,000 station-years of daily discharges to December 1973 on 15 reels of tape (some 133 million characters of data are stored at 800 bpi). Data are stored by District and by station number order within each District. To facilitate the retrieval and publication of monthly and annual mean discharges and total acre-feet, a TOTALS file is created from the FLOW file and contains the monthly totals in cfs-days for all stations on one reel of tape. Historical daily, monthly, and annual streamflow data can be supplied to users on punched cards or magnetic tape for computer processing. Instructions for plotting annual daily discharge hydrographs using the CYBER 74 computer and CALCOMP plotter at EMR were given. (Scott-ISWS)
W75-10913

DESCRIPTION OF CARD AND TAPE FORMATS FOR SUPPLYING DATA TO USERS.
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
1975. 15 p.

Descriptors: *Canada, *Hydrologic data, *Date storage and retrieval, *Data processing, Streamflow, *Discharge(Water), Sediments, Monthly, Annual, Average, Suspended solids, Information retrieval, Hydrometry, Annual peak discharge.
Identifiers: Daily.

A description was given of the various card and tape formats in which hydrometric data for Canada can be supplied to users. Streamflow and sediment data can be supplied in card format either on punched cards or magnetic tape. Daily discharge data can also be supplied in main file format on magnetic tape. As of 1975, the only data that can be supplied are daily discharges, monthly and annual mean discharges, and annual maximum instantaneous discharges in cfs for the period of record to December 1973 inclusive; and daily suspended sediment concentration in mg/l for the period of record to December 1970 inclusive. Period of record summary listings, indicating the months and/or years for which data are available, can also be supplied. The procedure by which users can request data for stations in each of the districts of Canada was indicated. This description is an updated version of the 1973 edition. As other types of hydrometric data become available on punched cards or magnetic tape for distribution to users, other updated editions will be published. (Scott-ISWS)
W75-10914

AUTOMATED HOURLY COMPUTATIONS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
K. W. Stewart.
January 1975. 68 p, 16 fig.

Descriptors: *Computer programs, *Data processing, *Streamflow, *Water levels, State-discharge relations, Gages, Discharge(Water), Data storage and retrieval, Information retrieval, Automation, Computers.
Identifiers: *Hourly.

A set of detailed instructions was given to automate streamflow and water level computations at selected time intervals by using a digitizer interfaced with a card punch. Detailed instructions for digitizing water level recorder charts were provided to obtain punched cards containing the X-Y coordinates. With these cards and the card decks defining the stage-discharge relationships and gage and shift corrections, the computer program HOURLY (WSC No. J21019) is used to obtain instantaneous gage heights and/or discharges. The following options are available in this program: (1) a listing of the expanded stage-discharge table; (2) a listing of the instantaneous discharges or instantaneous gage heights, or both, on a selected time interval of 15 minutes or 1, 2, 3, 4, 6, or 8 hours, and for a selected number of days; (3) card output of the instantaneous discharges or instantaneous water levels, or both; (4) processing of linear, 'curved-line,' or 'arc-line' charts (both the 'curved-line' and the 'arc-line' charts have a curved gage height axis but the 'curved-line' charts have a nonlinear vertical scale and the 'arc-line' charts have a linear vertical scale.); (5) plotted output of the chart record as digitized; and (6) plotted output of the computed instantaneous discharges and/or water levels. (Scott-ISWS)
W75-10915

QUALITY OF WATER IN AQUIFERS OF THE AMARGOSA DESERT AND VICINITY, NEVADA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W75-10932

TEMPERATURES OF KANSAS STREAMS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 2E.
W75-10933

THE MINOR AND TRACE ELEMENTS, GAS, AND ISOTOPE COMPOSITIONS OF THE PRINCIPAL HOT SPRINGS OF NEVADA AND OREGON,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W75-10937

ESTIMATED AVAILABILITY OF SURFACE AND GROUND WATER IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W75-10938

LOW-FLOW CHARACTERISTICS OF SELECTED STREAMS IN NORTHEASTERN WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2E.
W75-10939

GROUND WATER IN THE CORVALLIS-ALBANY AREA, CENTRAL WILLAMETTE VALLEY, OREGON,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-10940

ESTIMATED MEAN-MONTHLY AND ANNUAL RUNOFF AT SELECTED SITES IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2E.
W75-10943

RECHARGE AREAS OF THE FLORIDAN AQUIFER IN SEMINOLE COUNTY AND VICINITY, FLORIDA,
Geological Survey, Tallahassee, Fla.
C. H. Tibbals.
Florida Bureau of Geology, Tallahassee, Map Series No. 68, 1975. 1 sheet, 3 fig, 6 ref.

Descriptors: *Groundwater recharge, *Groundwater resources, *Aquifer characteristics, *Florida, Hydrologic data, Maps, Water wells, Withdrawal, Water supply, Rainfall, Hydrology, Hydrogeology, Hydrologic budget.
Identifiers: *Seminole County(Fla), *Floridan aquifer, Recharge areas.

The Floridan aquifer is the most important source of water supply in Seminole County, Florida. Virtually all public and domestic water supplies and most of the water used for irrigation are from wells that tap the Floridan. Hence, delineating the areas that recharge the aquifer is important. This map report shows those areas where the Floridan aquifer is subject to recharge or discharge. Recharge to the Floridan aquifer can occur wherever the water table (or a lake surface) is above the potentiometric surface of the Floridan. However, the rate of recharge is governed by: (1) the thickness and permeability of the intervening confining beds and (2) the degree of hydraulic potential, or head difference, between the water-table aquifer and the Floridan aquifer. (Woodard-USGS)
W75-10944

WATER RESOURCES OF THE LOWER ST. CROIX RIVER WATERSHED, EAST-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
G. F. Lindholm, J. O. Helgesen, W. L. Broussard, and D. F. Farrell.
For sale by USGS, Reston, Va 22092, $2.25 per set. Hydrologic Investigations Atlas HA-490, 1974. 3 sheets, 22 ref.

Descriptors: *Water resources, *Watershed management, *Minnesota, *Hydrologic data, Maps, Hydrographs, Climatic data, Hydrologic budget, Water utilization, Surface waters, Groundwater resources, Water resources development, Watershed management, Aquifer characteristics, Streamflow, Water yield, Water quality, Geology, Bedrock, Glacial drift.
Identifiers: *Lower St. Croix River(Minn).

This 3-sheet atlas describes water resources of the lower St. Croix River watershed, east-central Minnesota. Average annual precipitation in the watershed is about 28 inches. Of that amount, about 22 inches is removed by evaporation and transpiration. The average annual runoff is about 6 inches. Virtually all large water users in the watershed obtain water supplies from bedrock aquifers. Withdrawals in 1967 exceeded 1.2 billion gallons. Groundwater is generally very hard, greater than 180 mg/liter. Water from any of the formations may be high in iron, exceeding the recommended limits of 0.3 mg/liter for drinking water. The lower St. Croix River, its tributaries, and many lakes, provide an abundance of water of good quality which is suitable for most industrial, municipal, and agricultural uses. Flooding is not a major problem in the basin. Most flood damage is confined to the vicinity of Lake St. Croix. Streamflow is sustained during dry periods by the large amount of natural storage, both on the surface and in the ground. (Woodard-USGS)
W75-10945

WATER RESOURCES OF THE SNAKE RIVER WATERSHED, EAST-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
G. F. Lindholm, J. O. Helgesen, W. L. Broussard, and D. W. Ericson.
For sale by USGS, Reston, Va 22092, $2.00 per set. Hydrologic Investigations Atlas HA-488, 1974. 3 sheets, 20 ref.

Descriptors: *Water resources, *Watershed management, *Minnesota, *Hydrologic data, Maps, Hydrographs, Groundwater resources, Aquifer characteristics, Hydrology, Water utilization, Water yield, Water quality, Groundwater recharge, Surface waters, Streamflow, Geology, Glacial drift, Bedrock, Evapotranspiration, Soil moisture, Flood frequency.
Identifiers: *Snake River watershed(Minn).

This 3-sheet atlas describes water resources of the Snake River watershed in east-central Minnesota. All domestic, municipal, and industrial water supplies in the watershed are obtained from groundwater sources. Water use is greatest at Mora where withdrawals doubled from 1964 to 1969. Precipitation, the primary source of recharge to the watershed, averaged about 28.9 inches per year during 1939-68. Evapotranspiration, the main discharge process, is generally greatest in July and August, commonly resulting in moisture deficits for optimum plant growth. The average annual runoff from the Snake River basin is about 8.5 inches. Groundwater is generally very hard (greater than 180 mg/liter) and of the calcium magnesium bicarbonate type. The larger base-flow yields in the basin are from streams draining outwash areas. During base-flow periods, a substantial amount of the flow in the Snake River is from groundwater discharging directly to the main channel. Seventy-five percent of the annual minimum flows in the lower reaches of the Snake River occur late in the winter. (Woodard-USGS)
W75-10946

WATER RESOURCES OF THE LOWER MINNESOTA RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
H. W. Anderson, Jr., D. F. Farrell, and W. L. Broussard.
For sale by USGS, Denver, Colo 80225, and Reston, Va 22092, $2.25 per set. Hydrologic Investigations Atlas HA-526, 1974. 3 sheets, 9 ref.

Descriptors: *Water resources, *Watershed management, *Minnesota, *Hydrologic data, Maps, Hydrographs, Groundwater resources, Streamflow, Runoff, Water quality, Hydrology, Hydrologic budget, Water utilization, Aquifer characteristics, Water yield, Groundwater recharge, Glacial drift, Evaluation, Geology.
Identifiers: *Lower Minnesota River(Minn).

This 3-sheet atlas describes the water resources in the Lower Minnesota River watershed in south-central Minnesota. The main sources of water are precipitation and flow in the Minnesota River, which enters the watershed from the south. All municipalities use groundwater supplies. Glacial sand and gravel are widely used aquifers in the west. The Dresbach, Jordan, and St. Peter aquifers are the most reliable and widely used in the central and eastern parts. The use of groundwater is about 12,000 million gallons per year. This estimate represents 0.34 inch of water used compared with 28.8 inches of precipitation, 24.3 inches of evapotranspiration, and 4.5 inches of runoff. Considerably more water could be used without seriously depleting the amount of groundwater in storage or affecting the water budget. Dissolved solids, sulfate, and bicarbonate concentrations in water from glacial deposits decrease generally from west to east. Dissolved solids range from 900 mg/liter from areas of gray till to generally less than 400 mg/liter from areas of red till and from outwash deposits. Runoff is greatest in the spring and early summer, after the spring breakup. Ru-

noff may be high locally in the summer after intense storms. (Woodard-USGS)
W75-10947

WATER RESOURCES OF THE CANNON RIVER WATERSHED, SOUTHEASTERN MINNESOTA,
Geological Survey, Reston, Va.
H. W. Anderson, Jr., D. F. Farrell, W. L. Broussard, and P. E. Felsheim.
For sale by USGS, Denver, Colo 80225 and Reston, Va 22092, $2.25 per set. Hydrologic Investigations Atlas HA-522, 1974. 3 sheets, 6 ref.

Descriptors: *Water resources, *Watershed management, *Minnesota, *Hydrologic data, Maps, Hydrographs, Surface waters, Streamflow, Runoff, Sediment transport, Water quality, Groundwater resources, Aquifer characteristics, Hydrology, Geology, Water yield, Water utilization, Hydrologic budget, Water supply.
Identifiers: *Cannon River watershed(Minn).

This 3-sheet atlas describes the water resources of the Cannon River watershed in southeastern Minnesota. The 1,462 square miles of land surface in the watershed varies considerably from areas of low hills and plains to areas dominated by streams deeply incised into bedrock. Water entering the watershed as precipitation is approximately equal to surface runoff plus evapotranspiration. No significant areas of groundwater decline are known, indicating that the volume of water in storage is fairly constant. Water use in 1970 for public supply, rural supply, and self supplied (industrial and thermoelectric power), was 6,423 million gallons of groundwater and 26,216 million gallons of surface water. The population that year was 84,000. (Woodard-USGS)
W75-10948

THE HYDROLOGIC CYCLE--AS APPLICABLE TO THE PACIFIC NORTHWEST,
Geological Survey, Tacoma, Wash.
D. Molenaar.
Available from Washington State Dept. of Ecology, Tacoma, Wash, $1.00 in paper copy. Washington State Department of Ecology, Olympia, Geohydrologic Monograph 4, 1975. 1 map.

Descriptors: *Maps, *Hydrologic cycle, *Pacific Northwest US, Climatic zones, Precipitation(Atmospheric), Runoff, Surface waters, Groundwater, Hydrology, Evaporation, Evapotranspiration, Transpiration.

This map of the hydrologic cycle representative of conditions in the Pacific Northwest, shows the pattern of water movement as it circulates through the natural system--as precipitation from the atmosphere to the earth, as surface runoff and streamflow to the sea, as percolation into the ground and seepage back to the surface, and as evaporation and transpiration back to the atmosphere. Precipitation as rain and snow is the source of all freshwater. A part of the precipitation runs off rapidly to streams, and a part is evaporated directly back to the atmosphere from the ground and from lakes, streams, and plant surfaces. A part soaks into the soil where some is drawn up by plants and returns to the atmosphere by evapotranspiration through and from the leaves; the remainder percolates downward to a zone of saturation to become groundwater. In turn, most of the groundwater returns to the surface-water system by seepage to springs, lakes, streams, and the sea. The Pacific Northwest is a land of climatic and topographic contrasts that are reflected as extremes in natural hydrologic conditions. Average annual precipitation varies widely, from more than 200 inches at places in the higher mountains to less than 8 inches in the semiarid region east of the Cascade Range. (Woodard-USGS)
W75-10949

CONTOUR MAP OF THE BEDROCK SURFACE, NEW BRITAIN QUADRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
E. H. Handman.
Miscellaneous Field Studies Map MF-523 C (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 135), 1975. 1 sheet, 1 map, 4 ref.

Descriptors: *Soils surveys, *Connecticut, *Geologic mapping, *Bedrock, Contours, Geologic investigations, Mapping, Overburden, Soils, Sediments, Rocks.
Identifiers: *Bedrock surface maps, *Britain(Conn), Urban geology.

Contours show the altitude of the bedrock surface in the New Britain quadrangle, Connecticut. The position of the contours is based largely on data from wells, test holes, and published geologic maps supplemented by knowledge of the geologic history of the region. The map shows the configuration of the bedrock surface if all unconsolidated earth materials were removed. (Woodard-USGS)
W75-10950

MAP SHOWING DEPTH TO BEDROCK, WORTHINGTON QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
C. J. Londquist.
Miscellaneous Field Studies Map MF-662 A (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 136), 1975. 1 sheet, 1 map, 2 ref.

Descriptors: *Soils surveys, *Massachusetts, *Geologic mapping, *Bedrock, Geologic investigations, Overburden, Soils, Sediments, Rocks.
Identifiers: *Depth to bedrock, *Worthington(Mass), Urban geology.

This map indicates depth to bedrock below land surface in the Worthington quadrangle, Massachusetts. The locations of bedrock outcrops were obtained by field mapping and from a surficial geology map. Depths to bedrock are inferred from logs of wells and test holes and excavations for utility lines and foundations supplemented by data from a contour map of the bedrock surface. Depths shown are a generalization of localized highly variable conditions and do not include any weathered (decomposed) bedrock. (Woodard-USGS)
W75-10951

MAP SHOWING DEPTH TO BEDROCK, GREENFIELD QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
C. J. Londquist.
Miscellaneous Field Studies Map MF-629 B (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 140), 1975, 1 sheet, 1 map, 10 ref.

Descriptors: *Soil surveys, *Massachusetts, *Geologic mapping, *Bedrock, Geologic investigations, Overburden, Soils, Sediments, Rocks.
Identifiers: *Depth to bedrock, *Greenfield(Mass), Urban geology.

This map indicates depth to bedrock below land surface in the Greenfield quadrangle, Massachusetts. The locations of bedrock outcrops were obtained by field mapping and from a surficial geology map. Depths to bedrock are inferred from logs of wells and test holes and excavations for utility lines and foundations supplemented by data from a contour map of the bedrock surface. Depths shown are a generalization of localized highly variable conditions and do not include any weathered (decomposed) bedrock. (Woodard-USGS)
W75-10952

MAP SHOWING DEPTH TO BEDROCK, CHESTER QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
C. J. Londquist.
Miscellaneous Field Studies Map MF-667 A (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 141), 1975. 1 sheet, 1 map, 2 ref.

Descriptors: *Soil surveys, *Massachusetts, *Geologic mapping, *Bedrock, Geologic investigations, Overburden, Soils, Sediments, Rocks.
Identifiers: *Depth to bedrock, *Chester(Mass), Urban geology.

This map indicates depth to bedrock below land surface in the Chester quadangle, Massachusetts. The locations of bedrock outcrops were obtained by field mapping and from a surficial geology map. Depths to bedrock are inferred from logs of wells and test holes and excavations for utility lines and foundations supplemented by data from a contour map of the bedrock surface. Depths shown are a generalization of localized highly variable conditions and to not include any weathered (decomposed) bedrock. (Woodard-USGS)
W75-10953

MAP SHOWING DEPTH TO BEDROCK, MOUNT CARMEL QUANDRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
E. H. Handman, and M. H. Ginsberg.
Miscellaneous Field Studies Map MF-540 B (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 142), 1975. 1 sheet, 1 map, 5 ref.

Descriptors: *Soils surveys, *Connecticut, *Geologic mapping, *Bedrock, Geologic investigations, Overburden, Soils, Sediments, Rocks.
Identifiers: *Depth to bedrock, *Mount Carmel(Conn), Urban geology.

This map indicates depth to bedrock below land surface in the Mount Carmel quadrangle, Connecticut. The locations of bedrock outcrops were obtained by field mapping and from a surficial geology map. Depths to bedrock are inferred from logs of wells and test holes and excavations for utility lines and foundations supplemented by data from a contour map of the bedrock surface. Depths shown are a generalization of localized highly variable conditions and do not include any weathered (decomposed) bedrock. (Woodard-USGS)
W75-10954

HIERARCHIAL MODEL FOR WATER-SUPPLY-SYSTEM CONTROL,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 4A.
W75-10996

WATER RESOURCE OBSERVATORY CLIMATOLOGICAL DATA, WATER YEAR 1973.
Wyoming Univ., Laramie. Water Resources Research Inst.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 728, $7.25 in paper copy, $2.25 in microfiche. Water Resources Series No 49, October 1974, 200 p. OWRT A-999-WY0(21).

Descriptors: *Data processing, *Climatic data, *Temperature, Humidity, *Data collections, Precipitation(Atmospheric), Precipitation gages, Measurement.

Temperature and relative humidity data that have been reduced from hygrothermograph charts and precipitation data from recording and non-recording precipitation gages are presented in tabular form. Four readings per day at 0600, 1200, 1800, and 2400 hours and the maximum and minimum are presented. The mean, maximum, and minimum

temperatures are also shown graphically. The reduced data are transferred to punch cards for computation and tabulating by the University of Wyoming's digital computer.
W75-11035

STUDY OF CRITERIA AND MODELS ESTABLISHING OPTIMUM LEVEL OF HYDROGEOLOGIC INFORMATION FOR GROUNDWATER BASIN MANAGEMENT,
Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2F.
W75-11042

SOIL MAP OF THE WORLD, 1:5,000,000, VOLUME IV, SOUTH AMERICA.
Food and Agricultural Organization of the United Nations, Rome (Italy); and United Nations Educational, Scientific, and Cultural Organization, Paris (France).
FAO/Unesco, Paris (France), 1971. 193 p, 8 fig, 3 tab, 2 maps, 103 ref, 1 append.

Descriptors: *Soils, *Maps, *South America, Climates, Vegetation, Geomorphology, Petrology, Land use, Agriculture, Fertility, Water supply, Drainage, Mountains, Soil classification, Soil groups, Soil investigations, Soil properties, Soil surveys, Soil texture, Soil types, Distribution patterns.

The 2 map sheets which make up the Soil Map of South America are drawn on topographic base maps of the 1:5,000,000 series of the American Geographical Society Soil units divided into texture and slope classes are marked on the maps by symbols and colors. Text described the development of the map project, gave notes on uses of the maps, and details environmental conditions and soil uses in South America. The climate, vegetation, geomorphology, and lithology of South America were described and related to soil patterns. A description of the soils of the continent contained an extensive table of soil associations, an account of the distribution of the main soils, and a discussion of land use and soil suitability for agriculture. It was shown that only 5% of the land is under cultivation. Limitations affecting the agricultural use of soils are low natural fertility, poor drainage, and large areas of steeplands. The 10% of South America covered by productive soil regions shows potential for increases in agricultural productions. (Robinson-ISWS)
W75-11138

LAND AND WATER RESOURCES SURVEY IN THE JEBEL MARRA AREA, THE SUDAN.
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 4A.
W75-11139

CONCENTRATION AND GENERA OF ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1973,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W75-11165

COMPUTER SYSTEMS AND WATER RESOURCES,
Polytechnic Institute of New York, Brooklyn; and Illinois Univ., Chicago.
For primary bibliographic entry see Field 6A.
W75-11174

THE LOUISIANA ENVIRONMENTAL MANAGEMENT SYSTEM AND ITS UTILITY IN WATER RESOURCE PLANNING,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 5G.
W75-11177

DISTRIBUTION-SYSTEM OPERATION ANALYSIS MODEL,
Omaha Metropolitan Utilities District, Nebr. Services Dept.
For primary bibliographic entry see Field 5D.
W75-11180

COMPUTER ANALYSIS OF WATER-DISTRIBUTION SYSTEMS,
Springfield Dept. of Water, Light and Power, Ill.
For primary bibliographic entry see Field 4A.
W75-11182

ADVANCED TECHNIQUES IN THE MATHEMATICAL MODELING OF WATER-DISTRIBUTION SYSTEMS,
Beck (R. W.) and Associates, Seattle, Wash.
For primary bibliographic entry see Field 4A.
W75-11183

CAN A COMPUTER REALLY OPERATE A WATER-FILTRATION PLANT,
Kennedy Engineers, Inc., Tacoma, Wash.
For primary bibliographic entry see Field 5F.
W75-11184

FINITE-ELEMENT METHOD FOR WATER-DISTRIBUTION NETWORKS,
AC1 Environics, Melbourne (Australia).
For primary bibliographic entry see Field 4A.
W75-11186

AN ECONOMIC ANALYSIS OF THE POLLUTION PROBLEMS IN THE COLORADO RIVER BASIN: THE UPPER MAIN STEM SUB-BASIN,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 5G.
W75-11247

ECONOMICS OF GREAT LAKES SHIPPING IN AN EXTENDED SEASON,
Michigan Univ., Ann Arbor. Dept. of Naval Architecture and Marine Engineering.
For primary bibliographic entry see Field 6C.
W75-11248

MAKING LOG ANALYSTS OF GEOLOGISTS.
Oilweek, Vol 23, No 51, p 27-28, February 5, 1973. 2 fig.

Descriptors: *Analytical techniques, *Data processing, *Exploration, *Mapping, *Logging(Recording), *Resistivity, Porosity, Permeability, Regional analysis, Computer analysis, Data storage and retrieval.
Identifiers: Spontaneous potential.

Applying long-standing techniques used in interpretation of seismic data to well logs could increase the level of information gained. Automatic scanning systems now offer a highly accurate method of transcribing graphically-recorded log data to a digital tape. Once these are in common use data from logs can be used for more than location of stratigraphic traps. Porosity, apparent water, resistivity, lithology, radioactivity, density, velocity, and ratios of these can be easily assembled and used in regional exploration. Two examples are presented from the Anadarko Basin in western Oklahoma, and from the northeastern Williston Basin in southeastern Saskatchawan. (Bradbeer-NWWA)
W75-11288

MULTILAG MARKOV MODELS FOR EASTERN AUSTRALIAN STREAMS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11301

DETECTION OF CHANGE IN SEQUENCES OF HYDROLOGIC DATA,
Melbourne and Metropolitan Board of Works (Australia).
K. J. Langford, and R. A. Lewis.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 80-84, May 1975. 2 fig, 6 tab, 9 ref.

Descriptors: *Statistical methods, *Analytical techniques, *Hydrologic data, *Time series analysis, Rainfall, Land clearing, Rain gages.
Identifiers: Non-parametric statistics.

The sophistication of techniques used in an analysis should be in keeping with the quality and extent of the data as most hydrologic data are fairly rudimentary, for example rain guage measurements, simple analysis techniques are an appropriate first step. Some uses for non-parametric statistics are discussed, with particular emphasis on the detection of change in time sequences. A decrease of 4% in measured rainfall following clearing around a rain gauge was found to be significant. A control record is essential to detect such a small change. Changes of the order of 20% can be detected from individual records. (CSIRO)
W75-11302

GENERATION OF ARID ZONE RAINFALL AND RUNOFF,
University of New England, Armidale (Australia). School of Natural Resources.
For primary bibliographic entry see Field 2A.
W75-11303

DROUGHTS, DISTRIBUTIONS AND DEPENDENCE: AN ANALYSIS OF SOME SYNTHETIC DATA GENERATION METHODS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-11305

AUSTRALIAN ARID ZONE STREANGAUGING,
New South Wales Dept. of Public Works, Sydney (Australia). Water Supply and Sewerage Branch.
For primary bibliographic entry see Field 2E.
W75-11307

WORKSHOP ON COMPUTER-AIDED DESIGN AND SIMULATION OF WASTE TREATMENT SYSTEMS.
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5D.
W75-11338

8. ENGINEERING WORKS

8A. Structures

INTERBASIN WATER TRANSFERS: A CASE STUDY IN MEXICO,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 4A.
W75-10879

PREVENTING BACKFLOW IN PIPING CROSS CONNECTIONS,
Watts Regulator Co., Lawrence, Mass.
For primary bibliographic entry see Field 5B.
W75-11018

CONSOLIDATION AND REHABILITATION OF CANALS IN POUDRE VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.

W75-11061

BEACH EROSION CONTROL STRUCTURE,
S. S. Fair.
U.S. Patent No. 3,894,397, 4 p, 9 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 829, July 15, 1975.

Descriptors: *Patents, *Beach erosion, *Shore protection, Waves(Water), Ocean waves, Coastal structures, Sea walls.
Identifiers: Hollow concrete blocks.

A beach erosion control structure is described as a perforate wall that includes multiple courses of cored concrete blocks laid on their side so that the core holes provide horizontal passageways through the wall for the flow of water and entrained sand in incoming waves. The multiple rows of such blocks are arranged in such manner that the core holes of adjacent rows of blocks are staggered. The blocks can be preassembled by securing individual blocks into like block units, each block unit having three blocks assembled in a longitudinally staggered side-by-side relationship such that the core holes in adjacent blocks are offset. Such a wall may be laid up without the use of mortar. Instead, mechanical fastening, such as crimped straps, may be employed to couple adjacent courses to each other. Some or all of the block openings may be provided with reed or flapper-type valves which are swung open by an incoming wave, and then move to a partially closed position to resist or restrict the flow of water in ebbing waves. (Sinha-OEIS)
W75-11075

COULD THE SEA BE USED TO STORE WATER FOR SUPPLY.--A POSSIBLE SCHEME,
For primary bibliographic entry see Field 4A.
W75-11129

DESIGN OF THE OPTIMAL OUTFALL SYSTEM FOR A STREAM RECEIVING THERMAL AND ORGANIC WASTE DISCHARGES,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5B.
W75-11137

PREDICTING CAVITATION IN SUDDEN ENLARGEMENTS,
Colorado State Univ., Fort Collins. Hydro Machinery Lab.
For primary bibliographic entry see Field 8B.
W75-11151

GUIDELINES FOR THE IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS IN THE CONSTRUCTION AND OPERATION OF A RESERVOIR,
Illinois Univ., Urbana. Dept. of Forestry.
For primary bibliographic entry see Field 5C.
W75-11316

8B. Hydraulics

WAVE MOTION IN ROCKFILL,
Concordia Univ., Montreal (Quebec). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W75-10924

IMPLICIT NUMERICAL MODELING OF UNSTEADY FLOWS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
M. Amein, and H-L. Chu.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY6, Proccedings Paper 11378, p 717-731, June 1975. 9 fig, 3 tab, 16 ref, 2 append. NOAA Contract O-3528.

Descriptors: *Unsteady flow, *Numerical analysis, *Open channel flow, Hydraulics, Flow, Open channels, Mathematical studies, Boundary processes, Boundaries(Surfaces), *Model studies, *Hydraulic models.
Identifiers: Finite difference analysis.

A numerical model based on the equations of unsteady flow in open channels was used to compute unsteady flows in rivers and reservoirs. The cross sections of the waterways ranged from uniform to highly irregular, the type of flow ranged from slowly varied to abrupt changes in discharge, and nearly all combinations of boundary conditions were encountered. The model used an implicit finite difference method. The versatility, accuracy, stability, and efficiency of the method was demonstrated by field measurements. (Jess-ISWS)
W75-10925

STOCHASTIC ANALYSIS OF PARTICLE MOVEMENT OVER A DUNE BED,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 2J.
W75-10942

HORIZONTAL GROUNDWATER COLLECTORS, HYDRAULICS AND DESIGN,
International Water Supply Ltd., Montreal (Quebec).
P. O. Bourgeois.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 93-106. 5 fig.

Descriptors: *Water supply, *Groundwater resources, *Aquifers, Wells, Hydrology, Recharge, Hydraulic design, Water wells, *Caissons.
Identifiers: *Horizontal groundwater collector.

A horizontal groundwater collector or radial screen well is a large diameter concrete caisson with several screens driven laterally from its lower level outwards through sand and gravel near a stream or lake. It is used to abstract groundwater from an unconsolidated aquifer hydraulically connected to a body of surface water. A summary is presented of hydrodynamic principles which are used to determine yield, design and development of horizontal groundwater collectors. Field testing and analysis of yield includes: test drilling to establish the real extent of the aquifer and its stratigraphic characteristics; pumping tests to establish the characteristics of the aquifer such as transmissibility, permeability, and coefficient of storage which can then be used to determine the contribution of recharge of the adjacent stream; and, collector yield calculations which involve the above information plus the effective radius of the collector which is defined as the equivalent radius of a vertical well which under the same conditions of drawdown would produce an equivalent yield. Caisson design, lateral drain design, and screens selection are also discussed. Additional research is needed to improve on the methods described for obtaining and using the basic information required in determining the hydraulics for arriving at a collector design. (Orr-FIRL)
W75-10998

HORIZONTAL GROUNDWATER COLLECTORS, 'CANADA'S LARGEST WATER WELL',
Prince George City Engineer's Office (British Columbia).
C. E. Obst.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 107-123. 8 fig.

Descriptors: *Water supply, *Groundwater resources, *Aquifers, Wells, Costs, Hydrology, Infiltration galleries, Water sources, Potable water, Hydrodynamics, *Water wells, *Canada, *Caissons.
Identifiers: *Horizontal groundwater collectors.

The City of Prince George, British Columbia, initiated planning in 1970 for methods to increase their supply of potable water. The choices included: duplication of a successful and inexpensive infiltration gallery; a raw water intake from the Nechako River with a conventional water treatment plant; and, groundwater supply from the Nechako Aquifer. The installation of a single collector well with horizontal well screen was chosen as the most viable alternative. Details of the exploratory investigation (test drilling and pumping) and examination of the preliminary hydrogeology are presented. The results established that a groundwater aquifer existed, that the water quality from test pumping was acceptable, that the recharge capability of the aquifer was good and the grain size analysis of the granular soil appeared to be acceptable for a sand-free well development. The design and construction of the collector are outlined. The total project costs were $1,125,000 or less than ten cents per gallon capacity for the total capital cost of intake, treatment and pumping. It is concluded that the original objectives of Prince George of providing a safe, abundant supply of high quality potable water at the least possible cost has been achieved through the installation of a horizontal collector well. (Orr-FIRL)
W75-10999

SOME RESULTS ON MASS TRANSFER PROCESSES IN A DENSITY-STRATIFIED FLOW,
Mississippi Univ., University. Dept. of Mechanical Engineering.
J. A. Fox, L. A. Roe, and C. V. Alonso.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 692, $3.75 in paper copy, $2.25 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, August 1975. 26 p, 10 fig, 22 ref. OWRT A-081-MISS(1).

Descriptors: *Flow characteristics, *Density stratification, Diffusion, Shear flow, Lakes, Reservoirs, *Stratified flow, *Mass transfer, Saline water, *Mixing, Eddies, Turbulence, *Turbulent flow.
Identifiers: Richardson number.

A stream of relatively pure water was made to flow over a body of heavier, saline water. The general aim was to study the mixing between the two fluids of different density. This process was investigated in two laboratory flumes and the data were analyzed with a view toward obtaining quantitative estimates of mixing. The main concern in presenting the results is in the relation of the Richardson number to turbulent mixing and the vertical eddy diffusivity coefficient. The existence of a high local Richardson number of a flow of fresh water over a saline solution lower layer in the vicinity of the interface between the two layers seems to inhibit turbulent mixing. The local Richardson number approaches zero away from the interface on either side of it. Indirect calculation of the vertical eddy diffusivity coefficient from experimental data shows a strong relation with Richardson number between zero and two for the flows considered, indicating a strong damping with increasing Richardson number.
W75-11057

EFFECT OF PRESSURE GRADIENT ON WIND-WAVES IN A LABORATORY CHANNEL,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
J. D. Lin, and H. C. Liang.
In: Proc Second US National Conference on Wind Engineering Research, June 23-25, 1975 Fort Col-

lins, Colorado, Colorado State University, 3 p, 7 fig, 1 tab, 10 ref. OWRT A-021-CONN(3), 14-01-0001-1075.

Descriptors: *Wind tides, *Turbulent boundary layers, Laboratory tests, Channels, *Open channel flow,
Identifiers: *Wind-generated waves, Boundary layer pressure gradient, Wind-wave channels, Aerodynamic roughness, Two phase flow, Boundary layer shear.

The results derived from a wind-wave channel study of the effect of pressure gradient on the characteristics of wind-generated waves are presented. The results indicate that a mild pressure gradient normally existing in a wind tunnel of uniform cross section with a solid flat bottom is amplified when the bottom is replaced by a water surface. The pressure gradient also caused an excessive 'set-up' of water surface. The favorable (negative) pressure gradient renders a positive streamwise shear stress gradient which might be responsible in part for the larger growth rate of wind-waves in addition to the component due to direct energy transfer. (deLara-Connecticut)
W75-11093

HYDROLOGIC INVESTIGATION AND DESIGN OF URBAN STORMWATER DRAINAGE SYSTEMS,
Snowy Mountains Engineering Corp., Canberra (Australia).
For primary bibliographic entry see Field 4A.
W75-11141

APPLICATION OF ELECTRICAL ANALOGY TO DRAW FLOW NETS FOR SUDDEN DRAWDOWN CONDITIONS IN EARTH DAMS,
University Coll. of Engineering, Burla (India). Dept. of Civil Engineering.
L. S. Joshi, and A. P. Misra.
Indian Geotechnical Journal, Vol 4, No 4, p 323-338, October 1974. 7 fig, 6 ref.

Descriptors: *Earth dams, *Slope stability, *Flow nets, *Phreatic lines, *Boundary processes, *Analog models, Laboratory equipment, Methodology, Laboratory tests, Analytical techniques, Drawdown.
Identifiers: *Sudden drawdown, Electrical analogy, Equipotential lines.

Flow nets are needed to make an accurate analysis of the stability of the water retaining face of an earth dam for sudden drawdown conditions. Flow of water in the body of the dam is in a transient state then. The nature and movement of the saturation line with elapsed time has been studied using a viscous fluid model. Such studies showed that the free saturation line at any instant is a flat parabola. Drawing of flow nets for sudden drawdown conditions was suggested with the help of electrical analogy apparatus. The laboratory apparatus and the procedural steps for drawing flow nets were detailed and exemplified. (Singh-ISWS)
W75-11143

EFFECTS OF ENTRANCE LOSS ON HARBOR OSCILLATIONS,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
U. Unluata, and C. C. Mei.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Soceity of Civil Engineers, Vol 101, No WW2, Proceedings Paper 11287, p 161-180, May 1975. 4 fig, 2 tab, 14 ref, 2 append. ONR Contracts NO0014-67-A-0204-0036, NR 062-338.

Descriptors: *Waves(Water), *Harbors, *Friction, *Laboratory tests, *Mathematical studies, *Resonance, Velocity, Head loss, Coastal engineering, Tsunamis, Fluctuations.
Identifiers: Harmonics.

The results of a theoretical study of wave induced response in a rectangular model harbor was reported. It was assumed that friction head loss was present across the harbor entrance. The loss was assumed to be quadratic in local velocity with a constant friction coefficient. Bottom and side-wall dissipation were not considered. It was shown that odd higher harmonics were present. The resonance characteristics of the fundamental harmonic response in the harbor were significantly influenced by the additional damping due to friction, especially for the lowest peaks. While in the perfect fluid theory, these peaks heighten with diminishing entrace width; in the presence of friction, the opposite was true for a sufficiently narrow mouth. (Bhowmik-ISWS)
W75-11147

TURBULENT STRUCTURE NEAR SMOOTH BOUNDARY,
Stone and Webster Engineering Corp., Denver, Colo.
P. H. Blinco, and D. B. Simons.
Journal of the Engineering Mechanics Division, Proceedings of American Society of Civil Engineers, Vol 101, No EM3, Paper 11372, p 241-255, June 1975. 11 fig, 16 ref, 2 append.

Descriptors: *Turbulence, *Boundary layers, *Time series analysis, *Flow characteristics, Reynolds number, Laboratory tests, Analysis, Fluid mechanics, Shear stress, Boundaries(Surfaces), Shear, Anemometers.
Identifiers: *Turbulent structure, *Energy spectra, Boundary shear, Hot film anemometers.

Digital time series analysis of constant temperature hot film anemometer signals were analyzed for a Reynolds number range from 18,600 to 136,000. A miniature boundary layer type sensor and a Flush Surface Hot-Film sensor were used in a smooth boundaried tilting flume. Results of the analysis revealed that: (1) the instantaneous boundary shear stress was a low frequency process with most of its spectral energy associated with frequencies below 5 Hz; (2) the spectral distributions were dependent on the bulk flow variables with higher frequency energy content increasing with increasing Reynolds number; (3) decomposition of the instantaneous boundary shear stress into an extreme value counting process was shown to agree with the so-called 'bursting process'; (4) the mean period between shear stress excursions varied with the 3/4 power of the Reynolds number and, when made dimensionless by use of the bulk flow variables, the mean bursting was a constant; and (5) time-space correlation between the longitudinal velocity fluctuations and the boundary shear stress indicated that a large inclined turbulent structure was responsible for the transfer of turbulence into the viscous sublayer. (Adams-ISWS)
W75-11148

TRANSITION IN OSCILLATORY FLOW OVER RIPPLED BEDS,
Cambridge Univ., (England). Dept. of Engineering.
J. F. A. Sleath.
The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 309-322, June 1975. 7 fig, 1 tab, 13 ref.

Descriptors: *Turbulent flow, *Transition flow, *Laminar flow, Fluid mechanics, Anemometers, Reynolds number, Hydraulics, Hydrodynamics, Beds, Ripple marks, Sand waves, Velocity.
Identifiers: *Oscillatory flow, *Rippled bed, Flow stability, Velocity measurements, Random instability.

Velocity measurements were made in order to investigate the way in which oscillatory flow over rippled beds become turbulent. The tests were carried out with a range of rippled beds oscillated in still air and water and a hot wire anemometer was used to measure the velocity. For a given bed and amplitude of oscillation, it was observed that below a certain critical frequency of oscillation the flow remained laminar. At higher frequencies random instabilities appeared. Depending on the amplitude of oscillation, these instabilities may reach a limiting value as frequency is increased still further, or they may eventually break down into turbulence. A curve was proposed for the conditions under which the random instabilities first appeared. Conclusions were drawn as to the conditions under which flow produced by wave action over a rippled bed is laminar or turbulent. It was suggested that the observed instability is indepenedent of transition caused by grain roughness, which may be calculated separately. (Lee-ISWS)
W75-11149

THE DESIGN OF STORM WATER DRAINAGE CHANNELS USING MATHEMATICAL MODEL TECHNIQUES,
Hydraulics Research Station, Wallingford (England).
W. R. White, and R. K. Price.
The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 91-102, March 1975. 8 fig, 3 tab, 9 ref, 1 append.

Descriptors: *Storm runoff, *Storm drains, *Urban drainage, *Urban hydrology, *Mathematical models, *Open channel flow, Urban runoff, Open channels, Routing, Unsteady flow, Continuity equations, Momentum equation, Flood routing, Drainage systems, Networks, Hydrographs.
Identifiers: *Colebrook-White transition. *Airport drainage.

The hydraulic aspects of the design of drainage schemes, the main arterial branches of which consist of open channels, were described. The Road Research Laboratory hydrograph technique was applied to the subsidiary pipe network system, but a new mathematical model technique was used for the main drainage channels. The spatially varied unsteady flow conditions within these channels were analyzed using a full solution of the equations governing continuity, momentum, and frictional resistance, the latter being defined in terms of the Colebrook-White transitional law. The new method was used in a feasibility study to determine the optimum drainage system for the proposed Maplin airport-seaport development and results from this investigation illustrated the method. (Terstriep-ISWS)
W75-11150

PREDICTING CAVITATION IN SUDDEN ENLARGEMENTS,
Colorado State Univ., Fort Collins. Hydro Machinery Lab.
J. W. Ball, J. P. Tullis, and T. Stripling.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11442, p 857-870, July 1975. 5 fig, 2 tab, 17 ref, 2 append.

Descriptors: *Cavitation, *Pitting(Corrosion), *Orifices, *Hydraulics, Energy dissipation, Valves, Pressure, Water conveyance, Nozzles, Water levels, Damages, *Design criteria, *Forecasting.
Identifiers: *Scaling effects, *Pressure effects.

In recent years incipient, critical, and choking cavitation levels have been introduced as design criteria for orifices and valves in pipelines. Recent studies have evaluated a fourth level, incipient cavitation damage, for orifices that is applicable to the design of sudden-enlargement energy dissipators. Design data for these four levels were included in the paper. Since cavitation in prototype structures can differ from that predicted by model studies, research was also directed toward evaluation of scale effects. The existence of scale effects due to pressure, size, and geometry for four levels

of cavitation was examined herein, and methods and equations for adjusting reference test data to structures of other sizes operating under different pressure conditions were presented. The location and distribution of cavitation pitting on the pipe wall downstream from the sudden enlargement was identified. The pitting was a function of expansion ratio and cavitation intensity. (Lardner-ISWS)
W75-11151

CAVITATION CONTROL BY AERATION OF HIGH-VELOCITY JETS,
Bureau of Reclamation, Denver, Colo. Hydraulics Branch.
G. L. Beichley, and D. L. King.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11462, p 829-846, July 1975. 10 fig, 1 ref, append.

Descriptors: *Cavitation, *Outlet works, *Flow around objects, *Hydraulic models, *Slide gates, Hydraulic structures, Jets, Discharge(Water), Spillways, Aeration, Erosion.
Identifiers: *Offsets, Palisades Dam, Navajo Dam, Pueblo Dam, Crystal Dam, Teton Dam, Slots, Deflectors.

To prevent cavitation erosion, air may be introduced along the underside and sides of a jet before the jet comes in contact with downstream concrete surfaces. Model studies of chute offsets, air slots, and deflectors were conducted to determine methods to aerate the jet and provide recommendations for altering two existing structures and designing new structures. A single test facility was used to model existing structures at Palisades and Navajo Dams and proposed structures at Pueblo, Crystal, and Teton Dams. Wall air vent slots combined with a floor deflector were developed for use immediately downstream from the gate frames in the two existing structures. Wall and floor air vent offsets away from the flow at the end of the frame were developed for new structures. These investigations, supplemented by general tests, formed the basis for guidelines developed for design of future air-entraining devices to protect flow surfaces from cavitation erosion. The best dimensions and locations for the slots and offsets were discussed, based on models of these specific structures. (Lardner-ISWS)
W75-11152

DERIVATION OF SURFACE WATER LAG TIME FOR CONVERGING OVERLAND FLOW,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W75-11156

MASS-EMPLACED SAND-FINGERS AT MARAROA CONSTRUCTION SITE, SOUTHERN NEW ZEALAND,
Otago Univ., Dunedin (New Zealand). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W75-11161

SIZE-SORTING DURING SUSPENSION TRANSPORTATION--LOGNORMALITY AND OTHER CHARACTERISTICS,
Indian Statistical Inst., Calcutta. Geological Studies Unit.
For primary bibliographic entry see Field 2J.
W75-11162

INVESTIGATION OF THE OPERATING CHARACTERISTICS OF THE IOWA SEDIMENT CONCENTRATION MEASURING SYSTEM,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2J.
W75-11163

LABORATORY INVESTIGATION OF ONE-DIMENSIONAL WAVE MOTION IN OPEN CHANNELS,
Tennessee Univ., Knoxville. Coll. of Engineering.
W. A. Miller, Jr., and B. A. Tschantz.
Paper presented at National Water Resources Engineering Meeting, American Society of Civil Engineers, Atlanta, Georgia, January 25, 1972. 40 p, 16 fig, 24 ref. OWRT B-010-TENN(2), B-012-TENN(2), and B-005-TENN(4).

Descriptors: *Waves(Water), *Open channel flow, Hydraulic transients, Unsteady flow, Velocity, Flow, Surges, Bores, Dam failure.

A three-year (1968-71) study is described in which laboratory measurements of some of the characteristics of one-dimensional waves in a channel were compared with values computed from a particular mathematical model and solution procedure. When boundary conditions, initial conditions, and channel geometry are accurately specified as input to the mathematical nodel, the leap-frog explicit solution scheme provides an accurate representation of the physical situation. The hydrogen bubble technique is a practical and feasible method for determining velocities in unsteady flow. Within the limits of the test data, neither the amplitude of the wave released into the channel nor the initial depth of water in the channel had an appreciable effect on the agreement between computed and measured values. For wave releases into a steady flow, proper specification of initial and boundary conditions for the model becomes more critical, and accurate experimental measurements are more difficult to obtain.
W75-11172

IMPROVED DESIGN OF DISTRIBUTION NETWORKS BY MINIMUM ROUTE,
Nihon Suido Consultants Co., Tokyo (Japan).
For primary bibliographic entry see Field 4A.
W75-11175

FINITE-ELEMENT METHOD FOR WATER-DISTRIBUTION NETWORKS,
ACI Environics, Melbourne (Australia).
For primary bibliographic entry see Field 4A.
W75-11186

APPROXIMATION FOR STEADY INTERFACE BENEATH A WELL PUMPING FRESH WATER OVERLYING SALT WATER,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 4B.
W75-11255

COLORADO CITY SOLVES ITS SAND PUMPING PROBLEMS,
Wright Water Engineers, Inc., Denver, Colo.
For primary bibliographic entry see Field 8C.
W75-11261

FORMULATION OF BOUNDARY CONDITIONS AT THE SURFACE OF A POROUS MEDIUM,
Alberta Univ., Edmonton.
G. Neal, and W. Nader.
Society of Petroleum Engineering Journal, Vol 14, No 5, p 434-436, October, 1974. 1 fig, 2 tab, 11 ref.

Descriptors: *Flow, *Porous media, *Boundaries(Surfaces), Aquifers, Filters, Porosity, Hydraulic conductivity, Flow system, Interfaces, Mathematical models, Darcy's law, Boundary layers, Hydraulics, Flow profiles, Transmissivity.
Identifiers: *Boundary conditions, Tangential velocity, Flow through a porous medium.

The governing flow equations in prediction of fluid flow occurring within adjacent regions of porous medium and open space are Darcy's Law and the Navier-Stokes equation. The boundary conditions usually assumed are that the mass flux normal to the surface is continuous, that the pressure is continuous across the surface, and that the tangential velocity in the free fluid tends to zero at the surface. The last assumption is an approximation. It is tested by comparison with two more explicit assumptions; confirmation of the approximation is the result. (Bradbeer-NWWA)
W75-11269

THE MECHANICS OF ROCK FAILURE DUE TO WATER JET IMPINGEMENT,
Bell Telephone Labs., Inc., Whippany, N.J.
For primary bibliographic entry see Field 8E.
W75-11272

ANALYSIS OF FACTORS INFLUENCING MOBILITY AND ADSORPTION IN THE FLOW OF POLYMER SOLUTION THROUGH POROUS MEDIA,
Shell Oil Co., Houston, Tex.
G. J. Hirasaki, and G. A. Pope.
Society of Petroleum Engineers Journal, Vol 14, No 4, p 337-346, August, 1974. 8 fig, 7 tab, 25 ref.

Descriptors: Porous media, *Polymers, *Flow, Secondary recovery(Oil), Fluid mechanics, Injection, Oil wells, Adsorption, Chemistry, Organic molecules, Flooding, Oil fields, Oil reservoirs, Water wells, Groundwater, Aquifers, Reservoirs, Flow augmentation, Permeability, Porosity, Clogging.
Identifiers: Pseudoplastic flow, Viscoelastic flow, Blake-Kozeny mode(Flow).

Displacement of oil by polymer solution has characteristics not present in normal water flooding. Rheological behavior of the flow could be Newtonian at low flow rates, pseudoplastic at medium flow rates, and dilatant at high flow rates. The pseudoplastic behavior is modeled with the Blake-Kozeny model. The dilatant behavior is modeled with the viscoelastic properties of the polymer solution. Permeability reduction may be due to an adsorbed layer of polymer molecular coils that reduces effective pore size. The ratio of the size of the polymer molecular coil to an effective pore radius of the medium is used to correlate the permeability reduction factor with the polymer, brine, and rock properties. A model has been developed to represent adsorption as a function of these properties assuming the polymer is adsorbed as a monolayer of molecular coils that have a segment density greater than the molecular coil in dilute solution. (Bradbeer-NWWA)
W75-11275

HOW TO SEAL TUBING COLLAR LEAKS.
For primary bibliographic entry see Field 8C.
W75-11287

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 4: PITFALLS IN OVERPRESSURE PREDICTION,
Continental Oil Co., Ponca City, Okla. Production Research Dept.
For primary bibliographic entry see Field 8G.
W75-11294

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 5: PREDICTING HYDROCARBON ENVIRONMENTS WITH WIRELINE DATA,
Continental Oil Co., Houston, Tex. Production Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11295

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 6: CORRELATING GEOPRESSURE GRADIENTS WITH HYDROCARBON ACCUMULATIONS,
Continental Oil Co., Houston, Tex. Production Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11296

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 7: THE SHALE RESISTIVITY RATIO - A VALUABLE TOOL FOR MAKING ECONOMIC DRILLING DECISIONS,
Continental Oil Co., Houston, Tex. Production Engineering Services.
For primary bibliographic entry see Field 8G.
W75-11297

8C. Hydraulic Machinery

EXPERIMENTAL STUDY OF THE COOLING WATER SYSTEM, SETUBAL POWER PLANT, RIO SADO, PORTUGAL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-10855

ADJUDICATING TENDERS FOR AERATION DEVICES: BEST VALUE AND RELIABILITY,
For primary bibliographic entry see Field 5D.
W75-10972

PUMP SELECTION,
Associated Engineering Services Ltd., Vancouver (British Columbia).
R. Walker.
In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 41-56. 7 fig, 5 ref.

Descriptors: *Pumps, *Waste water treatment, *Sewage treatment, *Equipment, *Costs, Sewerage, Pumping.

Since pumping water and waste water adds only to the cost and not to the value of a product, it is imperative that the pumping cost should be as low as possible. The four major factors in the cost structure of pumping are installed cost-amortization, power or fuel costs, supervision and maintenance, and, the cost of down time and standby equipment. In comparison to the overall cost of the entire installation the actual cost of the pumps and motors is a relatively small item. It is better to buy equipment which may not be the cheapest but which will cost less in terms of fewer repairs and less maintenance. Future expectations of rising fuel costs necessitate that good system design be implemented to insure that the best possible use is made of the purchased energy. Down time of the system can be minimized with the installation of three pumps rather than the conventional two (one pump running, one down for maintenance, and the third unit in standby in case the operating unit fails). Well pumps can either be vertical turbines or submersible pumps. If vertical turbine pumps are to be used, then a profile should be made of each well upon completion. The traditional booster pumps are horizontal, double suction closed impeller centrifugal pumps. The shaft diameter and the distance from center to center of the bearing pedestals are the parameters to consider when choosing these pumps. The selection of the appropriate pumps for sewage transport is also discussed, as well as the various makes of comminutors and self cleaning bar screens that have been designed to aid in sewage transport. (Orr-FIRL)
W75-11002

NOZZLE HYDRAULICS IN THE TRICKLE IRRIGATION SYSTEM--RELATION BETWEEN WATER TEMPERATURE AND NOZZLE FLOW RATE (IN JAPANESE),
Tottori Univ. (Japan). Sand Dune Research Inst.
For primary bibliographic entry see Field 3F.
W75-11096

A SOLUTION TO PUMP STOPPAGES,
Irvine Ranch Water District, Calif.
S. Nelson.
Water and Sewage Works, Vol 121, No 9, p 106, September 1974.

Descriptors: *Pumps, *Sludge digestion, Solids, Flow, *Sewage treatment, *Waste water treatment, Treatment facilities, Equipment.
Identifiers: Comminutor/Macerator, Irvine Ranch Water District.

One problem in sludge digestion and treatment is the stoppage of waste pumps. This is caused by large articles such as cans, bottles, rags, and sticks which get pumped along with primary sludge to an aerobic digester, then to drying beds where they cause the pumps to become inoperative. The Irvine Ranch Water District has solved this problem by the use of a new unit called the Disposable Waste Systems Comminutor/Macerator, installed in the influent channel. This six inch model processes solid material prior to any pump action. The unit can run unattended for several months. The Irvine Ranch Water treatment plant has been using this machine for eight months continuously. Primary sludge and skimming pumps that feed the Comminutor/Macerator share a common discharge line; flow can be to both pumps at once or to either individually. Three new Comminutor/Macerators, 40 inch models, will be installed in the system in the near future. (Prague-FIRL)
W75-11111

AERATION DEVICES: THE MANUFACTURER'S VIEWPOINT,
For primary bibliographic entry see Field 5D.
W75-11121

CAVITATION CONTROL BY AERATION OF HIGH-VELOCITY JETS,
Bureau of Reclamation, Denver, Colo. Hydraulics Branch.
For primary bibliographic entry see Field 8B.
W75-11152

CAN A COMPUTER REALLY OPERATE A WATER-FILTRATION PLANT,
Kennedy Engineers, Inc., Tacoma, Wash.
For primary bibliographic entry see Field 5F.
W75-11184

A PNEUMATIC SYSTEM TO PUMP WATER FROM PIEZOMETERS,
Department of the Environment, Lethbridge (Alberta). Research Station.
T. G. Sommerfeldt, and D. E. Campbell.
Ground Water, Vol 13, No 3, p 293, May-June, 1975. 2 fig.

Descriptors: *Pump, *Piezometers, *Water pressure, *Hydraulic equipment, Measurement, Research equipment, On-site equipment, Design.
Identifiers: *Pneumatic pump.

A system to pump water from piezometers is operated by compressed air. It is especially useful where maximum suction lift, 32.5 feet at sea level, is exceeded and the casing is smaller than 3 inches. The pump is described and diagrammed. It has performed satisfactorily without air leakage. (Bradbeer-NWWA)
W75-11257

PITLESS ADAPTERS: EMPHASIS ON SANITATION,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
W. J. Witsell.
Water Well Journal, Vol 29, No 4, p 56-58, April, 1975. 1 fig.

Descriptors: *Casings, *Wells, *Well regulations, *Pollution, Frost protection, Corrosion, Quality control, *Environmental sanitation.
Identifiers: *Pitless adapters, *Well pits, Pitless units, Poisonous gases, Well head.

Because of the pollution hazards involved, a well pit to house pumping equipment or to permit accessibility to the top of a water well is not recommended and, in some cases, is prohibited. The two general types of pitless installations are the pitless adapter, which connects the well from below the frost line to the pumping components, and the pitless unit which is an entire unit mounted on the well casing that has been cut off at the required depth. Problems of installation in this type of equipment often arise. Welding below ground is not conducive to good workmanship. Similarly, achieving a watertight joint is difficult. Clamps and gaskets for attachment of adapters and units are often criticized for their structural weakness. Compatibility between metals on the well, the pitless device, and the welding materials is necessary. Finally, provision for settlement of the well head is necessary. Procedures for inspecting and testing the pitless installations are important as they are installed within the zone of greatest corrosion and contamination potential within the upper 10 feet of the well structure. Testing procedures are outlined. (Bradbeer-NWWA)
W75-11258

LONGER LIFE FOR SUBMERSIBLES.
For primary bibliographic entry see Field 8G.
W75-11259

ELECTRICAL TESTS FOR SUBMERSIBLE PUMPS,
For primary bibliographic entry see Field 8G.
W75-11260

COLORADO CITY SOLVES ITS SAND PUMPING PROBLEMS,
Wright Water Engineers, Inc., Denver, Colo.
R. D. Tafelski.
Johnson Drillers Journal, p 1-3, March-April, 1975. 2 fig.

Descriptors: *Groundwater, *Sands, *Pumping, *Quality control, *Well filters, Well casings, Well screens, Gravels, Wells, Water wells, Sand aquifers, Filters, Silting, Sediment control, *Colorado.
Identifiers: *Burlington(Colo), *Sand pumping, *Ogallala aquifer, Pierre shale.

Investigations into the problem of sand pumping wells in Burlington, Colorado were made in 1973. Initial pumping in each well produced sand. Continued pumping reduced the amount of sand. As the problem worsened with time, the decision was made to drill a series of replacement wells. The new wells completely pierced the Ogallala and continued five feet into the Pierre shale. The size of the gravel pack was reduced and polyphosphates were introduced to aid in breaking down any mudcake on the borehole walls. The well was developed with careful backwashing to prevent the disruption of the gravel pack. The resulting wells produced sand-free water. (Bradbeer-NWWA)
W75-11261

WILL SUBMERSIBLES MAKE JET PUMPS OBSOLETE.
Water Well Journal, Vol 29, No 4, p 53-54, April, 1975.

Descriptors: *Pumps, *Cost comparison, *Cost analysis, Jets, Hydraulic equipment, Equipment, Performance, Deep-well pumping.
Identifiers: *Submersible pump, *Injector pump, *Ejector pump, Jet pump, Working head pump.

A comparison of the relative costs, capacities and working depths of the three types of pumps, working head, ejector and submersible, is made. Costs of installation are competitive at settings from 100 to 500 feet. The jet pump, or ejector alone, is cheapest but its cost rises when the cost of extra pipe length is added. The submersible pump is the most costly to manufacture but requires less pipe and cable to operated. The installation, access and repair of the jet pump are simplest of the three; but it has limitations as to the depth of installation. In wells of 4-inch diameter or larger and settings below 80 feet, the submersible pump develops the greatest volume of water per horsepower. The deeper the setting, the greater the capacity and horsepower advantage for the submersible. The deep well working head pump can be used in wells of narrower diameter. For wells of less than 100 feet, the ejector pump is best in price, capacity and installation ease. (Bradbeer-NWWA)
W75-11263

INSTALLING SUBMERSIBLES.
Water Well Journal, Vol 29, No 4, p 47-48, April, 1975.

Descriptors: *Pump testing, *Pumps, Planning, Loads(Forces), Well capacity, Aquifer properties, Power lead, Performance, Quality control, Hydraulic systems, Wells, Safe yield, Specific capacity.
Identifiers: *Submersibles, *Downhole pumping.

Proper planning and preparation are very important to the successful installation of a submersible pump and provide the best insurance against lost time on the job of installation. Well capacity should be predetermined to prevent over-pumping. Pre-installation checks of voltage capacity prevents burnouts. Other checks on wire size, length and placement of splices are common sense. A pump should be handled carefully and tested fully placing it downhole. Some tests for shipping damage are suggested. Once the submersible is emplaced careful operation should be the rule to insure maximum lifetime of the pump. (Bradbeer-NWWA)
W75-11264

UNCONVENTIONAL AIR DRILLING REDUCES WELL COSTS.
World Oil, Vol 178, No 7, p 91-93, June, 1974. 2 tab, 1 ref.

Descriptors: *Drilling, *Costs, Groundwater, Drilling equipment, Test wells, Borehole, Drilling fluid.
Identifiers: *Air drilling, Drilling techniques.

Data including penetration rates, number of bits per hole and a description of the cored formation as well as the drill bit types and sizes, pressures used and weight of the bits are tabulated and evaluated for two recent exploratory drilling programs by Shell Oil Company that involved air drilling. The costs reported illustrate the economic advantages of air drilling. (Bradbeer-NWWA)
W75-11270

DRILLING RATE AFFECTS COSTS MORE THAN BIT LIFE,
Sandia Labs., Albuquerque, N. Mex.
R. J. Lawrence.
Oil and Gas Journal, Vol 73, No 22, p 130-132, June 2, 1975. 3 fig, 4 ref.

Descriptors: *Drilling equipment, *Cost analysis, Economics, Evaluation, Equipment, Cost-benefit analysis, Wells, Efficiencies, Groundwater, Oil.
Identifiers: *Drilling rate, *Drill bit design, Cost reduction.

To simplify the economic evaluation of drilling costs it can be assumed that logging, casing, and completion costs are essentially fixed and independent of both drilling rate and drill bit life, the two areas open to improvement. Rotating and tripping costs are thus the only factors considered. Drilling rate is more significant than improved bit life from an economic point of view. Two examples to demonstrate this fact are given. (Bradbeer-NWWA)
W75-11279

'SELF-TAPPING SCREW' BIT WOULD USE LIGHTER WEIGHTS,
J. L. Kennedy.
Oil and Gas Journal, Vol 72, No 13, p 122-126, April 1, 1974. 11 fig, 1 ref.

Descriptors: *Drilling equipment, *Design criteria, *Penetration, *Weight, Pressure, Wells, Groundwater, Rotary drilling, Water wells.
Identifiers: *Drill bit, *Conical bit, Drilling rate.

A conical bit which uses its cutting to generate thrust forces is the basis of a program to develop a new boring technique. Because of the forces the bit requires only about 10% of the thrust of a conventional bit of similar diameter. The shape of the bit provides more cutting structure and produces a wedge-like effect on the rock. Cleaning should be improved as rock chips would not be caught under the bit. Also, if the side force generated is large enough or if the hole-bottom angle is small enough, the borer can be made self-advancing. Tests indicate the advantages of the conical bit. (Bradbeer-NWWA)
W75-11283

HOW TO SEAL TUBING COLLAR LEAKS.
Petroleum Engineer, Vol 45, No 6, p 66, June, 1973. 1 fig.

Descriptors: *Leakage, *Water wells, *Oil wells, *Linings, Technology, *Texas, Pressure Methodology, Seepage.
Identifiers: *Tubing collar, Bee County(Tex).

The technical solution to an actual problem case in Bee County, Texas is discussed. A leak in 2-inch tubing collar at 448 feet with tubing pressure 4150 psi and casing pressure 2000 psi was repaired in 5 hours with a 10-foot long steel liner. (Bradbeer-NWWA)
W75-11287

WATER SYSTEM ACCESSORIES,
W. Romano.
Water Well Journal, Vol 29, No 4, p 50-51, April, 1975.

Descriptors: *Water supply development, *Pumps, *Water pressure, *Public utilities, Overflow, Water rates, Water utilization, Water storage.
Identifiers: *Water system accessories, Pressure switch, Relief valve, Pressure tank.

A pump alone cannot provide automatic running water under pressure in all cases. Certain other accessories are needed and the combination of these forms a water system. The motor, the pressure switch, the relief valve, and the pressure tanks are basic components of a water system and provide the regulation of the amount of water pumped. A formula for estimating the pressure tank size necessary is presented, and examples are given. A larger than normal tank can be used to increase the useable volume of water in a slow producing well. An example of this is given. (Bradbeer-NWWA)
W75-11299

8D. Soil Mechanics

WAVE MOTION IN ROCKFILL,
Concordia Univ., Montreal (Quebec). Dept. of Civil Engineering.
M. S. Nasser, and J. A. McCorquodale.
Journal of the Waterways, Harbors and Coastal Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No WW2, Proceedings Paper 11286, p 145-159, May 1975. 7 fig, 21 ref, 2 append.

Descriptors: *Breakwaters, *Waves(Water), *Coastal engineering, *Dams, *Darcys law, Computers, *Mathematical models, Rockfill dams, Hydraulics, Porous media, Dispersion, Energy, Equations.
Identifiers: *Finite differences.

A mathematical model, coupling an external nonlinear wave and the resulting internal flow in a rockfill embankment with an impervious core was presented. The method of characteristics along with a finite difference scheme were utilized in the numerical solution. The model dealt with the nondarcy flow regimes but could be simplified to treat Darcy flow. Wave experiments on various rectangular rockfill embankments were described. The numerical solutions for typical slow and fast drop cases were compared with the corresponding experimental results. The theoretical and experimental wave transmission curves, reflection coefficients, and run-up values were shown to be in good agreement. (Bhomik-ISWS)
W75-10924

APPLICATION OF ELECTRICAL ANALOGY TO DRAW FLOW NETS FOR SUDDEN DRAWDOWN CONDITIONS IN EARTH DAMS,
University Coll. of Engineering, Burla (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-11143

GROUND WATER DEPLETION AND SUBSIDENCE PROBLEMS IN TAIPEI BASIN,
National Taiwan Univ., Taipei. Hydraulic Lab.
For primary bibliographic entry see Field 4B.
W75-11262

8E. Rock Mechanics and Geology

CONTOUR MAP OF THE BEDROCK SURFACE, NEW BRITAIN QUADRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-10950

MAP SHOWING DEPTH TO BEDROCK, WORTHINGTON QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-10951

MAP SHOWING DEPTH TO BEDROCK, GREENFIELD QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-10952

MAP SHOWING DEPTH TO BEDROCK, CHESTER QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-10953

MAP SHOWING DEPTH TO BEDROCK, MOUNT CARMEL QUANDRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-10954

THE MECHANICS OF ROCK FAILURE DUE TO WATER JET IMPINGEMENT,
Bell Telephone Labs., Inc., Whippany, N.J.
S. E. Forman, and G. A. Secor.
Society of Petroleum Engineers Journal, Vol 14, No 1, p 10-18, February, 1974. 10 fig, 2 tab, 17 ref.

Descriptors: *Jets, *Hydraulic mining, *Failure(Mechanics), Stress, Pressure, Rock mechanics, Young's modulus, Poisson ratio, Tensile strength, Porosity, Permeability, Nozzles, Flow.
Identifiers: *Water jets.

The initiation of fracture in a rock mass subjected to the impingement of a continuous water jet has been studied. The jet is assumed to place a quasi-static pressure loading on the surface of the rock, which is treated as a saturated, porous-elastic, isotropic, and homogeneous half-space. While this pressure loading is held constant, the impinging water flows through the rock according to Darcy's law and pressurizes the fluid in the pores. The pore pressure distribution couples with the stress field due to the surface loading to produce an effective-stress field, which can start tensile fracturing directly under the load. At various time intervals after initial impingement, the effective-stress field is computed using finite element methods and the results, together with the Griffith criterion for tensile failure, produce the loci of the zones of fracture initiation. The behavior of these zones is displayed as a function of the two jet parameters -- pressure and nozzle diameter -- and the five rock properties: Young's modulus, Poisson's ratio, tensile strength, porosity and permeability, and time. Experimental verification of the role of pore pressure was made in a laboratory study which is described. (Bradbeer-NWWA)
W75-11272

THEORY OF PLASTICITY OF POROUS MEDIA WITH FLUID FLOW,
Rice Univ., Houston, Tex.
M. Kojic, and J. B. Cheatham, Jr.
Society of Petroleum Engineers Journal, Vol 14, No 3, p 263-270, June, 1974. 16 ref.

Descriptors: *Plastic deformation, *Mathematical analysis, *Flow, *Viscosity, *Porosity, *Connate water, Structural geology, Deep water, Groundwater, Darcy's law, Mathematical model, Foundation investigation, Dam foundations, Rock mechanics, Rock properties, Porous media.
Identifiers: *Thrust fault(Geology).

Plastic deformation of a porous medium containing moving fluid is analyzed as a motion of a solid-fluid mixture. The fluid is considered to be Newtonian, and the porous material consists of interconnected pore spaces and of solid particles that can deform elastically. The effective stress principle and a general form of the yield function -- including work-hardening characteristics -- and general stress-strain relations are applied to describe the plastic deformation of the solid. The system of governing equations with the number of unknowns being equal to the number of equations is formed. A possible method of solution of a general problem is described. Some simplifications such as the assumptions of quasi-static plastic deformation and incipient plastic deformation with the application of Darcy's law for the fluid flow are discussed. To illustrate an application of the theory, the problem of incipient plane plastic deformation of a Coulomb material is presented. (Bradbeer-NWWA)
W75-11276

8F. Concrete

TECHNIQUES FOR LINEAR TIE-BACK CEMENTING,
MWL Tool and Supply Co., Midland, Tex.
H. E. Lindsey, Jr.
Petroleum Engineer, Vol 45, No 7, p 40-44, July, 1973. 1 fig.

Descriptors: *Linings, *Well casings, *Cements, Circulation, Sealants, Water wells, Oil wells, Deep wells, Groundwater, Leakage.
Identifiers: *Cementing, *Casing, strings, Cement placement.

Tie-back liners or casing strings are cemented to protect other casing in the well against pressure or corrosion, to close a leak, to add to confining strength or to cover worn or damaged casings. A tie-back liner usually extends from the top of a liner back to the surface but may extend only partially up the hole from the production liner. The two methods of cement placement around tie-back strings are by: (1) conventional circulation; and (2) reverse circulation. The equipment is different for each method. Which of these procedures is better is determined by the job requirements. (Bradbeer-NWWA)
W75-11277

HOW BP ALASKA CEMENTS THROUGH PERMAFROST.
Petroleum Engineering, Vol 45, No 4, p 38-42, April, 1973. 2 fig.

Descriptors: *Cements, *Mixing, *Permafrost, *Tundra, *Alaska, Oil wells, Technique, Portland cements, Gypsum, Concrete technology.
Identifiers: North Slope(Ala), Prudhoe Bay (Alas).

The approximately 2000 foot thick permafrost of Alaska's North Slope creates a unique problem in drilling methods and cement placement. Gypsum-portland cement blends offer an effective cement mixture of usage through permafrost because of their low heat of hydration, stability in freeze-thaw cycles, and wide range of temperature usage. Surface techniques and mixing equipment are described. The inner string cementing technique is used to cement the open hole. This technique along with precautions due to low temperatures is described. Also, three main types of batch mixing are evaluated for use at low temperatures. (Bradbeer-NWWA)
W75-11278

HOW TO MAKE SQUEEZE CEMENTING SUCCESSFUL,
Rike Service, New Orleans, La.
J. L. Rike.
Oil and Gas Journal, Vol 72, No 26, p 58-64, July 1, 1974. 3 fig, 3 tab, 20 ref.

Descriptors: *Wells, *Cements, *Slurries, *Sealants, *Methodology, Concrete additives, Concretes, Water wells, Well casings, Pipes, Groundwater.
Identifiers: *Squeeze cementing.

Squeeze cementing is an operation wherein cement slurry is forced under pressure to a specific point in a well, in order to repair casing or a cement job, or to seal the formation from well fluids. The significance of the volume of cement used, and of the pressure of the operation is delineated and the uses of high and low pressure squeeze are shown. Materials used as extenders, retarders, dispersants and accelerators in the cement slurry are described and their relative values are mentioned. Special problems that might aris during the operation such as lost circulation are recounted and control methods are suggested. (Bradbeer-NWWA)
W75-11286

CASING-SEAT TESTING - WHY AND HOW,
P. L. Moore.
Oil and Gas Journal, Vol 21, No 32, p 72-74, August 6, 1973. 5 fig.

Descriptors: *Pressure, *Water wells, *Drilling, *Testing, Frequency, *Methodology, Testing procedure, Concrete testing, Non-destructive testing, Quality control, Measurement, Casing, Well casing.
Identifiers: Leak-off, Casing seat, Fracture gradient.

Pressure testing below the casing seat is generally performed to test the cement job, and to determine the fracture gradient in the first sand below the casing shoe. The general procedure is discussed and some examples are given. Special considerations in running leak-off tests include the pumping rate, the decision to test, the pressure to be used, the frequency of testing and the maximum mud weight. These are discussed. (Bradbeer-NWWA)
W75-11291

CEMENTING TODAY'S PROBLEM WELLS.
Drilling, Vol 34, No 5, p 20-21, March, 1973.

Descriptors: *Cements, Technology, *Concrete additives, *Concrete technology, *Water wells, Linings, Pozzolans, Slurries, Concrete mixes, Concrete placing, Drilling, Casings, Deep wells.
Identifiers: *Thixotropic cement, Batch mixing(Cement), Continuous mixing(Cement).

The advantages and disadvantages of batch mixing and continuous mixing cement for use in wells are mentioned. Technological improvements of the continuous mixing process are predicted. The problem of cementing hot drill holes is met with a Class J cement in the form of supplements to certain oil well additives. A spacer, a hydrocarbon-based fluid which is compatible with mud and slurry, is credited with improving mud removal. Thixotropic slurries, gelatinous cements, are developed to support incompetent formations. (Bradbeer-NWWA)
W75-11293

8G. Materials

COMPUTER ALGORITHMS USEFUL FOR DETERMINING A SUBSURFACE ELECTRICAL PROFILE VIA HIGH FREQUENCY PROBING,
California Univ., Livermore. Lawrence Livermore Lab.
D. L. Lager, and R. J. Lytle.
UCRL-51748, February 13, 1975. 14 p, 23 fig, 13 ref. ERDA Contract W-7405-Eng-48.

Descriptors: *Algorithms, *Electromagnetic waves, *Geophysics, Computers, Mathematical studies, Mathematics, Electrical well logging, Exploration, *Subsurface mapping.
Identifiers: *High-frequency probing, ART algorithm, SIRT algorithm, BPT algorithm, Resolving power, Convergence rate, Tomography.

The data inversion algorithms developed in the last few years by investigators in the field of x-ray tomography for producing 3-D reconstructions of the human head and torso from 2-D projections have been applied to the problem of determining the structure of the ground between a pair of drill holes. The 'projections' were made by probing the ground at high frequencies and recording the magnitude and phase of the received signal for various positions of transmit and receive antennas. The region between the holes was divided into rectangular zones (like a checkerboard) and several algorithms were applied to assign appropriate values of electrical permittivity and skin depth to each zone. The three most successful algorithms to date have been modified versions of the tomographer's ART (algebraic reconstruction technique), SIRT (simultaneous iterative reconstruction technique),

and BPT (back projection technique). Results were presented to show the ability of the algorithms to resolve various-sized simulated anomalies that are analogous to voids and ore bodies. Finally, the results of experimental measurements were presented. (Sanderson-ISWS)
W75-10910

CORROSION BY DOMESTIC WATERS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5F.
W75-11062

LONGER LIFE FOR SUBMERSIBLES.
Water Well Journal, Vol 29, No 4, p 60, April, 1975.

Descriptors: *Corrosion, *Alkaline materials, *Pitting(Corrosion), *Pumps, Hydraulic equipment, Protection, Corrosion control, Chemical degradation, Water softening, Algae, Bacteria, Acidic water, Submerged, Equipment.
Identifiers: *Soda ash, Submersible pump.

Pitting due to organic growth on a pump and corrosion due to acid well water are two important causes of shorter life for pumps. Pitting occurs when bacteria or algae in well water attach themselves to the metal surface. They create minute electrolytic cells and a voltage differential between the metal under the organism and the water surrounding it. This differential is transmitted by metallic ions transferring into solution leaving behind a pit. Chlorination to kill the organisms can solve this problem. Corrosion by acid well water can be detected by sampling the water. Correction of acid water can be accomplished by addition of alkaline substances such as soda ash at the pump. (Bradbeer-NWWA)
W75-11259

ELECTRICAL TESTS FOR SUBMERSIBLE PUMPS,
R. C. Middleton.
Water Well Journal, Vol 29, No 4, p 61-62, April, 1975. 6 fig.

Descriptors: *Testing procedures, *Electrical equipment, *Resistivity, *Electric currents, Electric motors, Pumps, Water wells, Groundwater, Inspection.
Identifiers: *Submersible pump.

Submersible pump motors are designed to operate within a line-voltage variation limit of approximately plus-or-minus 10 percent. Voltage is suitably measured with a small a-c voltmeter at the control box, as for a single-phase motor, or at the magnetic starter as for a three-phase motor. The test method is shown in a diagram. Difficulties in a submersible pumps can also be caused by excessive current drain. To measure current an a-c ammeter is inserted in series with the line. Current should be measured in each of the three motor lines of a three-phase system, then unequal readings indicate trouble. Insulation resistance can be checked with a high range ohmmeter. Readings of less than 5 million ohms for a new installation indicate a leak in the system. (Bradbeer-NWWA)
W75-11260

BASIC CONCEPTS AND PRACTICAL ASPECTS OF CORROSION INVESTIGATION,
Corrosion Control Technologists, Houston, Tex.
M. A. Riordan.
Materials Protection and Performance, Vol 12, No 4, p 55-59, April 1973. 7 fig.

Descriptors: *Corrosion, *Oxidation, *Chemical degradation, Investigations, *On-site investigations, On-site data collection, Pipelines, Foundations, Well casings, Steel pipes, Water wells, Electrical potential.
Identifiers: IR drop measurements, Half cell method.

Four field techniques of corrosion investigation using common electrical measurements have been describd and categorized as to application under various field conditions. They include the IR drop measurements, the standard half cell method, soil-to-soil potentials, and pipe-to-soil potentials. The development of a fundamental corrosion circuit reference diagram has been reviewed step by step and its practical significance outlined. (Campbell-NWWA)
W75-11271

THE KINETICS OF CRYSTALLIZATION OF SCALE-FORMING MINERALS,
State Univ. of New York, Buffalo.
G. H. Nancollas, and M. M. Reddy.
Society of Petroleum Engineers Journal, Vol 14, No 2, p 117-126, April, 1974. 8 fig, 1 tab, 32 ref.

Descriptors: *Scaling, *Calcium sulfate, *Calcium carbonate, *Crystal growth, *Growth rates, *Kinetics, Hard water, Activation energy, Electrolytes, Descaling, Groundwater, Wells, Pipes, Phosphates, Water chemistry.
Identifiers: *Calcium sulfate, Scale inhibitors, Second order rate law, Phosphonate.

Reviewed is the kinetics of crystal growth of sparingly soluble minerals such as calcium carbonate, calcium sulfate, and barium sulfate, which frequently cause scaling problems in oil fields. For all three electrolytes, the crystal growth is surface controlled and follows a second-order rate law with an activation energy for the growth process of 10 to 20 kcal mol-1. The growth of calcium sulfate seeded crystal above 100 degrees C demonstrates the importance of characterizing polymorphic transformation processes. Phosphonate scale inhibitors show differing modes of inhibition in systems precipitating CaCO3 and CaSO4. (Bradbeer-NWWA)
W75-11273

DISSOLVED GASES ARE KEY CORROSION CULPRITS,
Petrotech Ltd., London (England).
C. C. Patton.
Oil and Gas Journal, Vol 72, No 29, p 66-69, July 22, 1974. 3 fig, 3 ref.

Descriptors: *Corrosion, *Dissolved oxygen *Electrochemistry, *Hydrogen sulfide, *Carbon dioxide, Flow rate, Aging(Physical), Chemical degradation, Well casings, Well screens, Oxidation, Steel, Chemical reactions, Deterioration.
Identifiers: *Corrosion cell, Dissolved gases.

Corrosion prevention is particularly important as drill pipe becomes scarcer and more precious. Corrosion theory and the susceptibility of steel and other metals to corrosion are discussed. The effects on corrosion rates of dissolved oxygen, carbon dioxide, and hydrogen sulfide are mentioned as well as the effects of physical variables such as fluid velocity and pressure. (Bradbeer-NWWA)
W75-11274

SIMPLE FIELD CHECKS WILL PROVIDE ACCURATE DST DATA,
Halliburton Services, Monahans, Tex.
S. J. Bateman.
World Oil, Vol 178, No 5, p 97-100, April, 1974. 6 fig, 6 ref.

Descriptors: *Pressure, *Testing, *Measurement, *Drilling, Procedure, Deep wells, High pressure, Hydrostatic pressure, On-site investigations, On-site tests.
Identifiers: *Drill stem test data.

Drillstem tests (DST) are an important exploratory tool but, in the past, only 35% of tests run have obtained information adequate for analyses. The importance and methods of testing are stressed and preliminary test chart evaluation procedures are outlined. The accuracy of the DST is limited by data quality that is assured only by careful testing procedure. (Campbell-NWWA)
W75-11281

SPECIAL ANNULUS FLUID EASES CASING RECOVERY.
World Oil, Vol 178, No 5, p 117, April, 1974. 2 fig.

Descriptors: *Drilling equipment, *Well casings, *Pipes, *Tubes, *Lubricants, Efficiencies, Water wells.
Identifiers: *Equipment recovery, *Dry wells, Annulus fluid.

An operator recently recovery 6,100 feet of intermediate casing from an unsuccessful wildcat well, three weeks after the pipe was set. Recovery was facilitated by a new annulus fluid which lubricates and protects the pipe until it is pulled. (Bradbeer-NWWA)
W75-11282

TESTS SHOW POTASSIUM MUD VERSATILITY,
NL Industries, Inc., Houston, Tex. Baroid Div.
T. C. Mondshine.
Oil and Gas Journal, Vol 72, No 16, p 120-130, April 22, 1974. 8 fig, 4 tab, 8 ref.

Descriptors: *Drilling fluids, *Mud, *Potassium compounds, *Feasibility studies, Stability, Shales, Stabilization, Salts, Surfactants, Oil wells, Water wells.
Identifiers: *Potassium lignite.

A new potassium-based mud system is prepared with potassium chloride or other potassium compounds, and contains a potassium lignite derivative for limiting shale hydration and reducing filtration. A special nonionic surfactant is used for controlling rheology. The system exhibits shale stability, solids tolerance, versatility, and thermal stability. Laboratory and field tests confirm its utility. Preparation of the system is recounted step-by-step. (Bradbeer-NWWA)
W75-11284

HOW TO FIND TRANSITION ZONES IN SOFT FORMATIONS,
Continental Oil Co., Houston, Tex.
P. E. Pilkington, and W. H. Fertl.
World Oil, Vol 180, No 5, p 98-102, April, 1975. 8 fig, 10 ref.

Descriptors: *Drilling, *Pressure, *Measurement, High pressure, Safety, Shallow wells, Drilling fluid, Weight, Groundwater, Water wells.
Identifiers: *Formation pressure, *Transition zones of pressure, Soft formations(Geologic), d exponent.

Pin-pointing transition zones in soft, shallow formations often in difficult, but when certain drilling variables such as overbalance and hydraulics are monitored and held constant, d exponent techniques can be used successfully. The d exponent is in widespread use as a formation pressure detection device. The d exponent is defined, problems in its use are discussed and some alternative means of improving utility of d exponent plots are suggested. (Bradbeer-NWWA)
W75-11285

MAKING LOG ANALYSTS OF GEOLOGISTS.
For primary bibliographic entry see Field 7C.
W75-11288

CASING-SEAT TESTING - WHY AND HOW,
For primary bibliographic entry see Field 8F.
W75-11291

HOW TO CONDUCT CORROSION TESTS,
J. D. Palmer.
Canadian Chemical Processing, Vol 57, No 8, p 52, 54-55, August, 1973. 3 fig.

Descriptors: *Corrosion, *Methodology, *Corrosion control, *Testing procedures, Evaluation, Testing, Materials testing, Laboratory tests, Quality control, Sampling, On-site tests, Materials.
Identifiers: *Corrosion tests, Corrosion detection.

Some degree of control over corrosion test conditions must be obtained. In the field, this control may be limited to knowing the operating conditions have not changed appreciably, or have changed in a specific way. Complete control over all material and operating variables may be obtained, but may be impractical. Exposure time of tests, preparation of samples, choice of samples, choice of measuring equipment, and sample size may all affect corrosion results. In tests involving an exposure, even the local weather may be a factor. (Bradbeer-NWWA)
W75-11292

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 4: PITFALLS IN OVERPRESSURE PREDICTION,
Continental Oil Co., Ponca City, Okla. Production Research Dept.
W. H. Fertl, and D. J. Timko.
World Oil, Vol 175, No 4, p 45-49, September, 1972. 6 fig.

Descriptors: *Drilling, *Pressure, *High Pressure, *Temperature, Evaluation, Salt, Shales, Drawdown, Caprock, Geophysics, Oil, Groundwater.
Identifiers: *Formation pressure, Sloughing, Pressure drawdown, Pressure seals, Pressure bridge.

The many factors that affect the use of wireline techniques to determine abnormal pressure environments are described. The proper compensation for these factors and their recognizable characteristics are given to avoid costly misinterpretations. A comprehensive discussion of how caprocks relate to overpressure is included. (See W75-11295 thru W75-11296) (Bradbeer-NWWA)
W75-11294

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 5: PREDICTING HYDROCARBON ENVIRONMENTS WITH WIRELINE DATA,
Continental Oil Co., Houston, Tex. Production Engineering Services.
D. J. Timko, and W. H. Fertl.
World Oil, Vol 175, No 5, p 73-80, 88, October, 1972. 6 fig, 54 ref.

Descriptors: *Drilling, *Pressure, *Temperature, *High pressure, *Spatial distribution, Distribution patterns, Oil, Gas, Hydrocarbons, Statistical methods, Correlation analysis, Groundwater, Exploration, Regional analysis, Oil industry, Deep wells.
Identifiers: Oil exploration.

Methods of predicting the presence of hydrocarbons in a geographical area of investigation are discussed. Methods involve comparing log derived reservoir data to statistical properties of hydrocarbon environments. The distribution of terrestrial heat, clay diagenesis, and the sand-shale ratio are included in an attempt to correlate such statistics with oil and gas occurrence. (See also W75-11294) (Bradbeer-NWWA)
W75-11295

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 6: CORRELATING GEOPRESSURE GRADIENTS WITH HYDROCARBON ACCUMULATIONS,
Continental Oil Co., Houston, Tex. Production Engineering Services.
D. J. Timko, and W. H. Fertl.
World Oil, Vol 175, No 6, p 79-82, November, 1972. 6 fig, 1 tab, 19 ref.

Descriptors: *Drilling, *Pressure, *Temperature, *Spatial distribution, *Oil, *Gas, *Hydrocarbons, Deep wells, Distribution patterns, Oil industry, Correlation analysis.
Identifiers: *Pressure-depth gradient.

Geopressure gradients are correlated with the spatial and depth distribution of hydrocarbon accumulations. Temperature-pressure-depth relationships and abnormal pressure conditions can be related to gas and oil fields, even size of reservoirs. In addition, some reasons why gas occurrence predominates at deeper depths are suggested. (See also W75-11294) (Bradbeer-NWWA)
W75-11296

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 7: THE SHALE RESISTIVITY RATIO - A VALUABLE TOOL FOR MAKING ECONOMIC DRILLING DECISIONS,
Continental Oil Co., Houston, Tex. Production Engineering Services.
D. J. Timko, and W. H. Fertl.
World Oil, Vol 175, No 7, p 59-63, December, 1972. 6 fig, 6 ref.

Descriptors: *Drilling, *Shale, *Resistivity, *High pressure, *Oil, Gas, Exploration, Geophysics, Oil industry, Oil wells, Deep wells, Statistical analysis, Groundwater.
Identifiers: *Shale resistivity ratio.

The shale resistivity ratio profile for an area such as the Gulf Coast, or similar geologic basins with sand-shale sequences, can save millions of drilling dollars. The profile can indicate whether it is possible for commercial production to exist below the depth to which the well has already been logged, and whether it is economically attrative to continue a borehole below a given depth. Basic guidelines for use of the method and some selected field examples of its application are presented. (See also W75-11294) (Campbell-NWWA)
W75-11297

HOW DOWNHOLE TEMPERATURES, PRESSURES AFFECT DRILLING; PART 8: NEEDLESS SPENDING OF DRILLING AND EXPLORATION MONEY CAN BE PREDICTED-AND PREVENTED,
Continental Oil Co., Houston, Tex. Production Engineering Services.
D. J. Timko, and W. H. Fertl.
World Oil, Vol 176, No 1, p 45-48, January, 1973. 7 fig.

Descriptors: *Drilling, *Exploration, *Oil, *Gas, *High pressure, Electrical well logging, Well data, Deep wells, Ground water.
Identifiers: *High pressure gradients.

Proper analysis of log-calculated temperatures and pressures can save millions of dollars by preventing unnecessary drilling and setting of additional casing in unfavorable hydrocarbon environments. How to predict whether commercial production can exist below a given depth in a drilling well is described and - as an example of the analysis method - why certain offshore Texas acreage is an extremely poor hydrocarbon prospect is explained. (See also W75-11294) (Campbell-NWWA)
W75-11298

8I. Fisheries Engineering

LIMNOLOGY OF DESERT PONDS,
Arizona Univ., Tucson. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2H.
W75-10880

SOME LIMNOLOGICAL CHARACTERISTICS OF ARIVACA LAKE IN SOUTHERN ARIZONA,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2H.
W75-10891

SURVIVAL AND GROWTH RATE OF CHANNEL CATFISH AS A FUNCTION OF DISSOLVED-OXYGEN CONCENTRATION,
Arkansas Univ., Little Rock. Dept. of Electronics and Instrumentation.
For primary bibliographic entry see Field 5C.
W75-11051

UNISEX STUDIES ON THE WHITE AMUR,
Bureau of Sport Fisheries and Wildlife, Stuttgart, Ark. Fish Farming Experiment Station.
For primary bibliographic entry see Field 5C.
W75-11205

THE EFFECTS OF THE FORMATION OF LAKE KAINJI (NIGERIA) UPON THE INDIGENOUS FISH POPULATION,
Ife Univ. (Nigeria). Kainji Dam Research Project.
For primary bibliographic entry see Field 5C.
W75-11223

EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. IV. FEEDING OF INTRODUCED AND AUTOCHTHONOUS NON-PREDATORY FISH,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W75-11234

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

DEVELOPMENT OF A BIBLIOGRAPHIC INFORMATION SYSTEM FOR WATER YIELD IMPROVEMENT PRACTICES,
Arizona Univ., Tucson. School of Renewable Natural Resources.
L. M. White, D. B. Thorud, and P. F. Ffolliott.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 696, $3.25 in paper copy, $2.25 in microfiche. Completion Report, August 1975. 6 p, 9 ref. OWRT A-042-ARIZ(9). 14-31-0001-3803.

Descriptors: *Information retrieval, Computers, *Bibliographies, *Water yield improvement, *Watershed management, *Arizona, Southwest U.S., Water yield, Forest management, Land management, Water sources, Vegetation effects, Water quality.
Identifiers: Bibliographic searches, Information systems, Literature searches.

Development of the Watershed Management Information System (WAMIS) began in 1972. WAMIS is designed to serve a variety of users who are interested in water and natural resource research in Arizona. WAMIS is a computerized bibliographic reference retrieval system which provides literature searches for users, in the form of individualized computer printouts of citations and abstracts, based upon a user's special interests. The literature covered in WAMIS includes effects of land management practices and vegetation management on water and other related resources, such as forage production, wildlife habitat, timber production, and recreational use. Research done in Arizona has been emphasized. General procedures used in banking and retrieval are described. Types of search requests have varied, including topics such as wildlife use of ponderosa pine forests, environmental and vegetation effects on evapotranspiration, hydrologic

modeling, Arizona water quality data, the effect of timber cutting practices on runoff, and revegetation of treated pinyon-juniper vegetation.
W75-11050

10C. Secondary Publication And Distribution

THE AWARENESS OF THE RELEVANT WATER RESOURCES LITERATURE BY THE PERSONNEL OF THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES,
Wisconsin Univ., Madison. Library School.
R. D. Walker, G. J. Zuck, R. E. Durrance, and J. R. Luedtke.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 500, $4.75 in paper copy, $2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS WRC 75-09, August 1975. 81 p, 23 ref, 18 charts, append. OWRT B-083-WIS(2). 14-31-0001-4138.

Descriptors: *Documentation, *Publications, *Information exchange, Technical writing, Wisconsin, Personnel.
Identifiers: *Wisconsin Department of Natural Resources, *Information transfer.

This study is the second part of the first phase of a more comprehensive research study to examine the transfer of information in the area of water resources. It deals with the physical characteristics, the sources of financial support, publishing sources, format, availability, and subject concentration of the literature (publications) designated to be relevant by a sample of water resources personnel employed by the Wisconsin Department of Natural Resources. Journal title dispersion is described for the applicable literature. Awareness or unawareness of the relevant literature is of primary concern as is a determination of the difference between the known and the unknown literature. (See also W75-07996)
W75-10899

HEAVY METALS AND OTHER TRACE ELEMENTS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W75-10934

NON-RENEWABLE, NON-ENERGY RESOURCES,
Leicester Univ (England). Public Sector Economics Research Centre.
For primary bibliographic entry see Field 6B.
W75-11253

THE TOXICITY OF DRILLING FLUID COMPONENTS TO AQUATIC BIOLOGICAL SYSTEMS, A LITERATURE REVIEW,
Fisheries and Marine Service, Winnipeg (Manitoba).
For primary bibliographic entry see Field 5C.
W75-11266

10D. Specialized Information Center Services

DEVELOPMENT OF A BIBLIOGRAPHIC INFORMATION SYSTEM FOR WATER YIELD IMPROVEMENT PRACTICES,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 10B.
W75-11050

10E. Translations

TRANSLATIONS ON ENVIRONMENTAL QUALITY, NO. 33.
Joint Publications Research Service, Arlington, Va.
For primary bibliographic entry see Field 05G.
W75-11246

10F. Preparation Of Reviews

HEAVY METALS AND OTHER TRACE ELEMENTS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 05B.
W75-10934

WATER AND WASTEWATER DISINFECTION WITH OZONE: A CRITICAL REVIEW,
Cincinnati Univ., Ohio.
For primary bibliographic entry see Field 05D.
W75-10956

COMPUTER SYSTEMS AND WATER RESOURCES,
Polytechnic Institute of New York, Brooklyn; and Illinois Univ., Chicago.
For primary bibliographic entry see Field 06A.
W75-11174

THE TOXICITY OF DRILLING FLUID COMPONENTS TO AQUATIC BIOLOGICAL SYSTEMS, A LITERATURE REVIEW,
Fisheries and Marine Service, Winnipeg (Manitoba).
For primary bibliographic entry see Field 05C.
W75-11266

CONSIDERATIONS FOR PREPARATION OF OPERATION AND MAINTENANCE MANUALS,
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 05D.
W75-11317

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